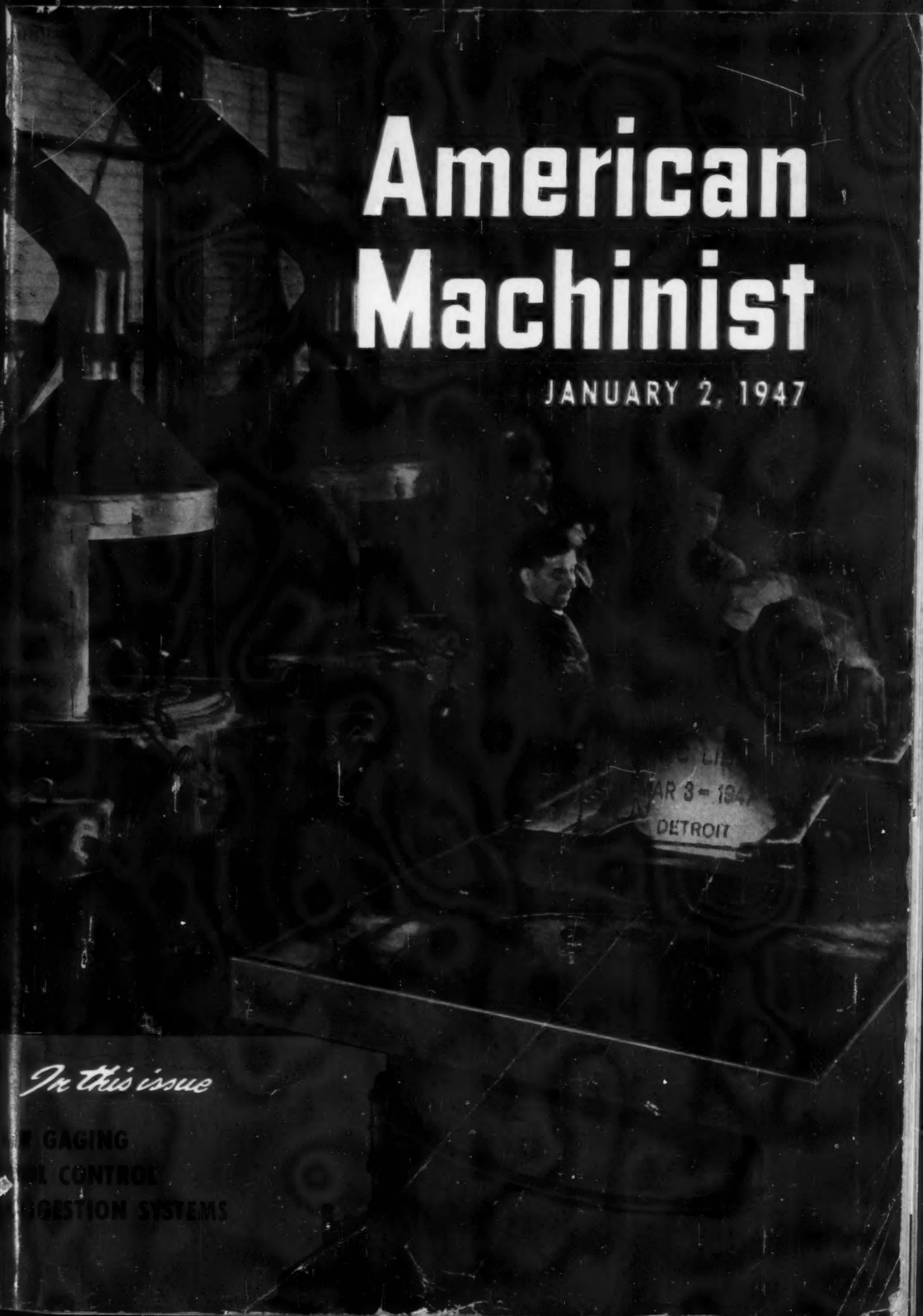

American Machinist

JANUARY 2, 1947

MAR 3 - 194
DETROIT

In this issue

GAGING
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GESTION SYSTEMS

ADD THIS PLANT TO YOURS IN 1947

THE HEALD MACHINE COMPANY is more than a machine tool manufacturer; it is a service organization for assisting industry in its many problems of how best to improve quality and cut costs.

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Perhaps you have a bothersome manufacturing problem on your new product, or wish to increase production and still improve the quality of your present goods. If so, any one of the 45 field engineers at our branch offices will be glad to study it over with you.

We can also offer you the services of our 150 engineers at Worcester. These men can turn to records covering 40 years of experience on precision finishing jobs the world over, and can offer suggestions and sketches to meet your most critical requirement.

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Put our plant to work for you. Call our nearest branch office, or better still make a personal visit to Worcester, where you can see for yourself our facilities for serving you. THE HEALD MACHINE COMPANY, Worcester 6, Mass.

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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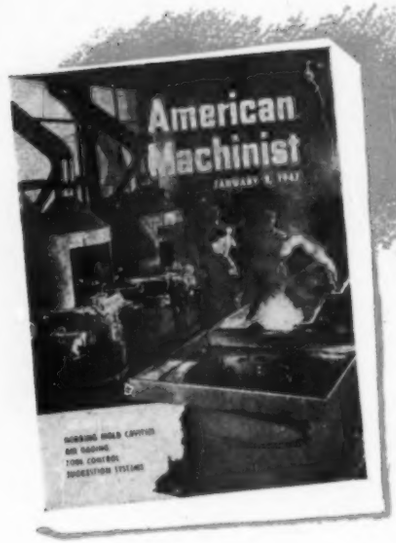


Chips and QUIPS

Salt-bath Hardening . . . Our cover Kodachrome shows chemically neutral salt-bath heat-treating furnaces at L. J. Mueller Furnace Company, Milwaukee. They hold molten salt within 5° of 1600 F. for heat-treating small parts, which are quenched in the oil tanks at right. In the background are twin 500-gal. degreasing tanks which hold an alkaline solution at 190 F. by means of a Mueller gas-fired boiler.

Exception . . . A while ago, we published an article giving a layman's ideas about suggestion systems. It drew a storm of protest, one of the best coming from the president of the National Association of Successful Suggestion Plans. Hence our first article from Swift & Co. (page 93). Our suggestion to Mr. Seinworth: more tenderloin steaks—and cheaper.

21 Times Faster . . . A. C. Spark Plug Division finds that making a pull rod by upset forging is 21 times faster than by screw machines, and that carbide inserts in the dies give long life The story will be in Jan. 30 *A.M.*

Hobbing or Hubbing? . . . Readers familiar with gear hobbing—a machining process—may be confused slightly by a forthcoming report. It deals with forming mold cavities for plastics or die casting, done by forcing in a shaped plunger, which should be called a "hub," just as the process should be "hubbing." But it's "hob" and "hobbing," according to the industry. Don't say we didn't warn you.

Helping Inside . . . A prison can help—or only harm. Nebraska State Penitentiary and San Quentin (Calif.) help the inmates by providing normal work. W. Lewis Johnson, who prepared the Nebraska data (page 76), says he is using our check, and other checks from *Sir!* and *New Detective* magazines, to help "pay off the checks that put me where I am—ironic, that!" He describes typical jobs in the prison machine shop, where ingenuity must often replace equipment . . . The San Quentin shots are from the hobby activities there, which have been a source of pocket money to many inmates. Hobby products are sold in a public shop.

Under Control . . . Carl G. Rising, chief engineer of the National Blank Book Company, has a working system for die, jig and fixture control. We got details from him, present them herewith . . . Ben Hamilton of Fellows Gear Shaper also offers an analysis of involute sliding that can be proved mathematically . . . There's a tricky chain guard for face-milling cutters and several other features—quit a bit of technical news with which to start the year.

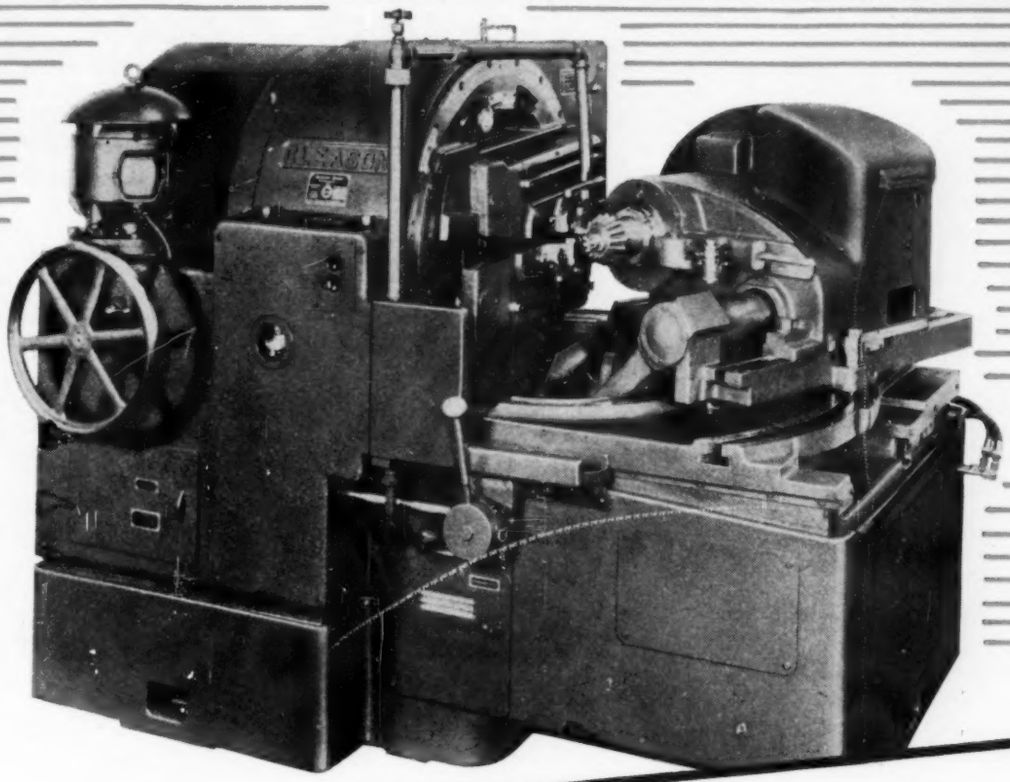
Gaging . . . We've put three articles on gaging into this one issue—a premium on a vital subject. First, there's Fay Aller's 2-part series on air gaging (see biog.), then Wm. Wehlau's ideas on gage usage, and finally a page describing tricks in gage making at Woodworth. There's variety for you!

Briefs . . . Included in fast-reading short articles are: Lt. Col. W. J. Darmody, telling of a surface-finish test, suggestions for hole broaches, some important ideas on an up-to-date approach to job evaluation, several ideas on face milling and our usual departments. For the more serious-minded, Dr. N. N. Sawin discusses interchangeability.

In Our Next . . . Jan. 16 *A. M.* will be our annual review, picturing and describing all the Shop Equipment, parts and materials described during 1946, a year-'round handbook . . . We also initiate, in that issue, a statistical summary, bringing you data in chart and tabular form that has not been previously available.

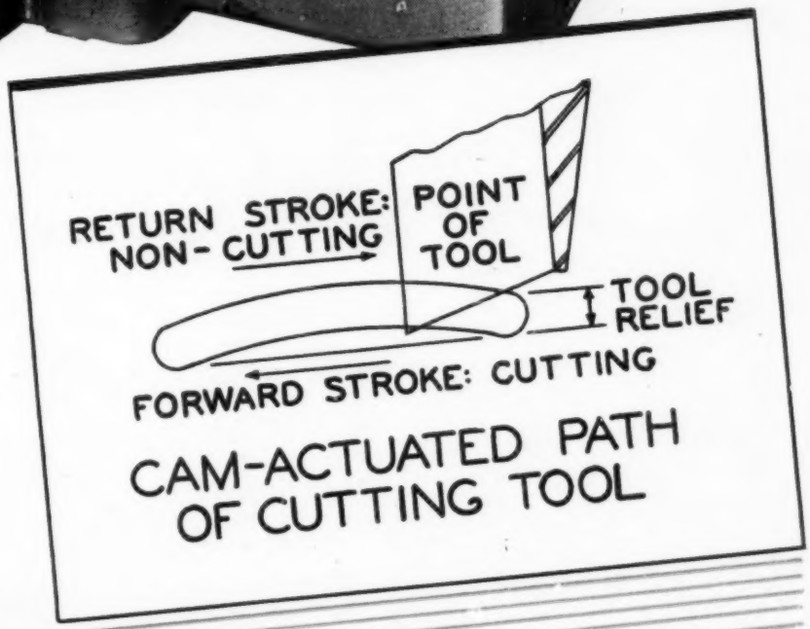
AIR GAGER . . . W. Fay Aller, research director of the Sheffield Corporation, Dayton, O., for the past six years, has been affiliated with that organization for the past 14 years. He was formerly chief engineer. Mr. Aller is credited with more than 50 patents covering gages and precision-measuring instruments, and he played an important part in the development of the air-flow type of gage mentioned in his two-part article, the first part of which leads this issue. The second half will appear in Jan. 30 A.M., the two providing a valuable compendium on a vital subject.

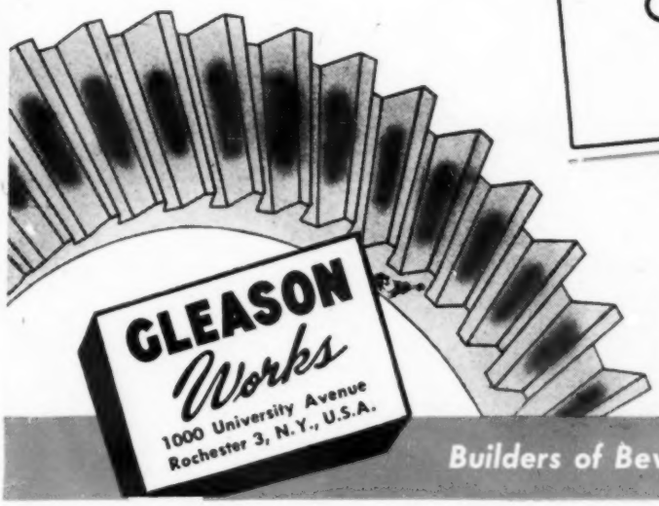
THE GLEASON BEVEL GEAR GENERATOR for CONIFLEX* GEARS



The latest Gleason Straight Bevel Generators in the intermediate (12" B Straight Bevel Generator illustrated) and large sizes incorporate such outstanding features as:

1. Localized tooth bearing* automatically cut into the gears.
2. Faster cutting made possible by its greater rigidity.
3. Ease of operation.





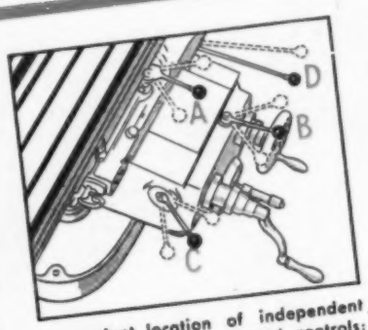
Coniflex gears have localized tooth bearing . . . accomplished by cam action during the cutting stroke and tool relief (withdrawal of the work on the return [non-cutting] stroke). Write for information on this new development in straight bevel gears.

Builders of Bevel Gear Machinery for Over Eighty Years

CINCINNATI No. 2 MI MILLERS *are easier to*

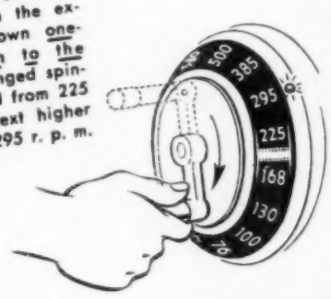
If you could spend a few minutes at the controls of the new CINCINNATI No. 2 MI Miller, you would understand why it is so well liked by the shopmen who have seen it. ¶ Look at the operational features illustrated here. All controls are arranged to simplify manipulation and reduce operator effort. Feeds and speeds are easily and quickly changed while standing at the normal working position. All other control elements are equally accessible. The No. 2 MI's are safe, they stay accurate for years, and maintenance cost is exceptionally low. Powered by 5 h. p. motors, they are available in Plain, Universal and Vertical styles. ¶ We'll be glad to tell you more about all the features of these versatile knee-and-column type milling machines and why they offer important cost cutting advantages to shops handling small- to medium-sized parts. Engineering details may be obtained by writing for catalog M-1429-1.

Pull out, quick adjusting micrometer dials on ho traverse controls are reset easily and quickly — thumbscrews to loosen.

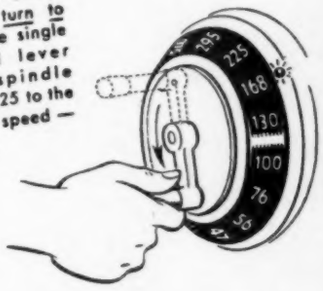


Convenient location of independent and directional power feed controls: A) Table feed lever. B) Cross feed lever. C) Vertical feed lever. D) Rapid traverse lever.

Right: A single lever selects all speeds. In the example shown one-half turn to the right changed spindle speed from 225 to the next higher speed—295 r. p. m.



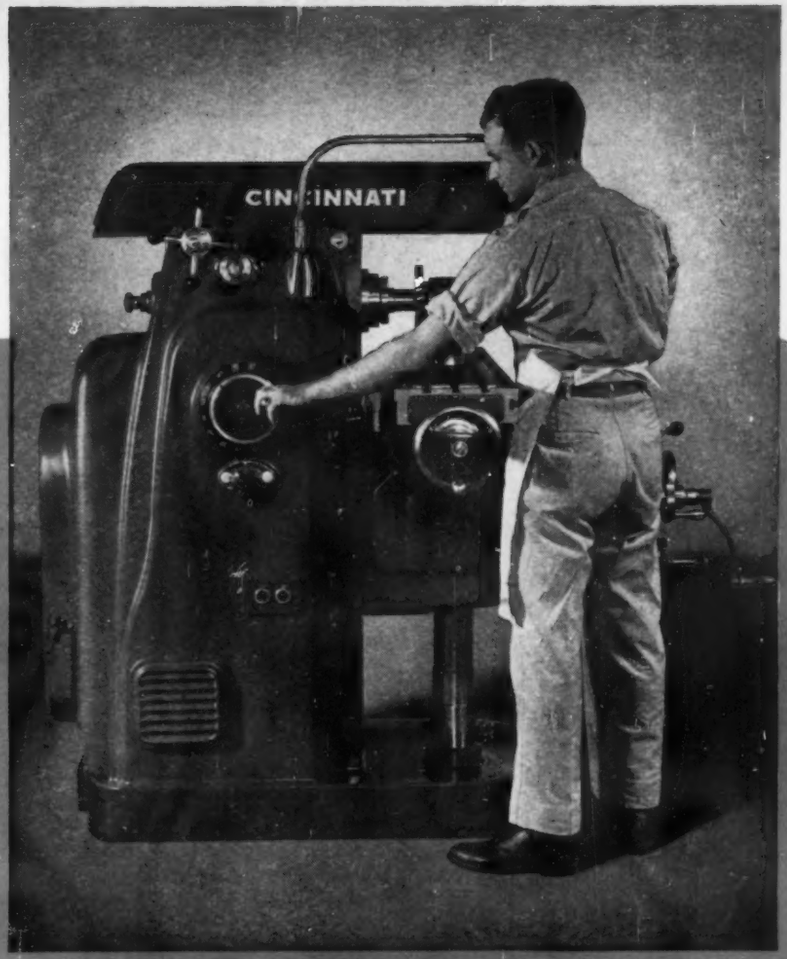
Right: In this example one-half turn to the left of the single speed dial lever changed spindle speed from 225 to the next lower speed — 168 r. p. m.



THE CINCINNAT

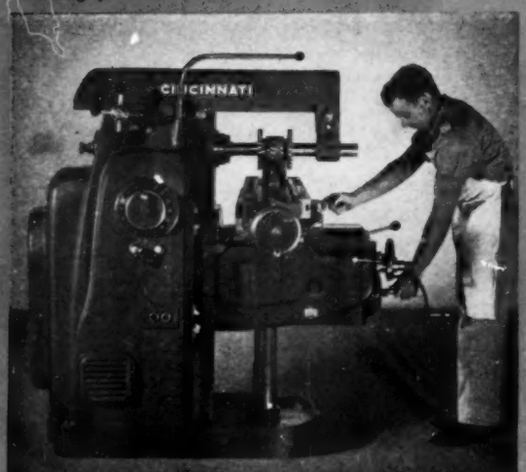
MILLING MACHIN

operate!

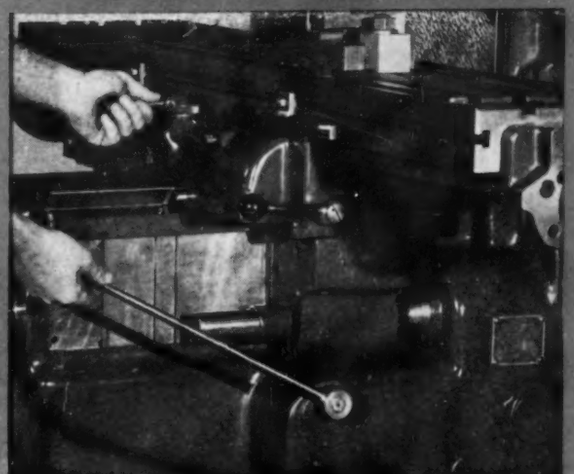


Changing spindle speeds from the front of the machine. Single lever on direct reading speed dial is within easy reach of operator's working position. The operator simply rotates the handle — hydraulics do the work of shifting gears.

The No. 2 MI's adjustable starting lever offers greater convenience in starting the machine from any desired working position.



A half turn of a single lever changes feeds. Similar to speed changes (see illustrations opposite page).



Engaging power rapid traverse to the table. This feature applies to cross and vertical movements also.

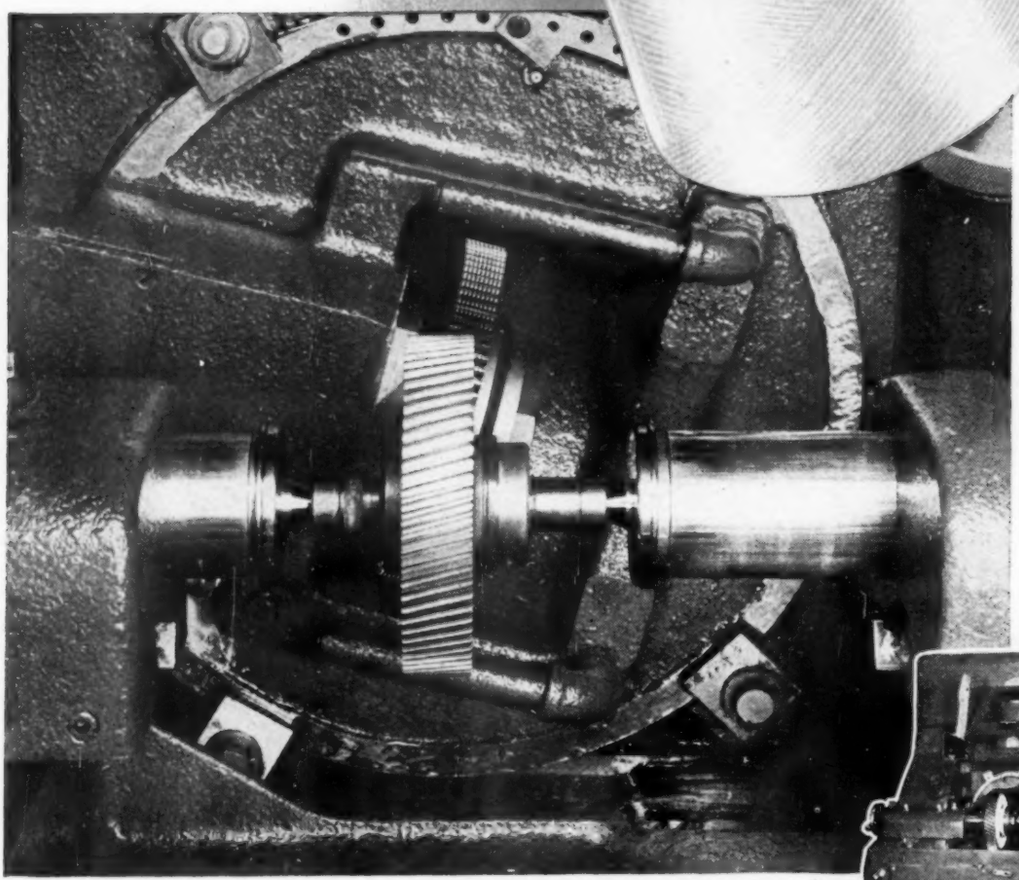
CINCINNATI

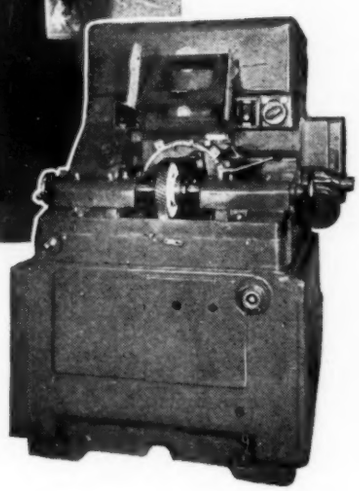
MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

SYNTHETIC FIBER THREAD HELD TO ± 1%

...WITH





Shaving Helical Gears for Synthetic Thread Twister on Fellows No. 12 Gear Shaving Machine.

● **GOVERNMENT SURPLUS MACHINE TOOLS:** We are licensed under the WAR ASSETS ADMINISTRATION to act as dealers in the disposal of Government Surplus Machinery. Those interested in obtaining such machinery should contact our Main Office, Springfield, Vt.; or our offices in Detroit, Mich. and Chicago, Ill.

THE FELLOWS METHOD...MACHINES AND TOOLS FOR

IN CROSS SECTION

GEARS OF *Constant* P. L. SPEED

Fellows Shaving Holds Synthetic Thread Twister Gears to Close Limits

The color uniformity of certain synthetic threads depends very largely upon close adherence to a precise diameter of strand. The production of uniform diameter thread requires close control over the twisting of synthetic fibers, and the stretching of the thread a uniform and predetermined amount. Relative velocity between "feed rolls" and "draw rolls" must remain constant, otherwise the thread will vary in thickness. So critical and precise are the requirements, that the "train" of driving gears must be held to near-perfect pitch line speeds.

Whitin Machine Works, an outstanding manufacturer of precision textile machinery, pioneered this gear development in their "Synthetic Fiber Twister". In cooperation with Fellows engineers the production solution was evolved... gear tooth cutting on Fellows Gear Shapers, and Shaving on Fellows Gear Shaving Machines. This method attained the desired accuracy in the helical gear "train" with the critical tolerances shown. It represents another case where the Fellows Method has assisted in producing accurate gears on an economical basis. Write for literature, or better yet, let our representative assist in helping you solve your gear production problems. The Fellows Gear Shaper Company, Springfield, Vermont... or 616 Fisher Bldg., Detroit... or 640 West Town Office Bldg., Chicago.

GEAR TOLERANCES

•

On 13 gears varying in size, pitch and helix angle, the following tolerances are maintained:

Run Out .... Max. .001"

Backlash .... Max. .00225"
Min. .001"

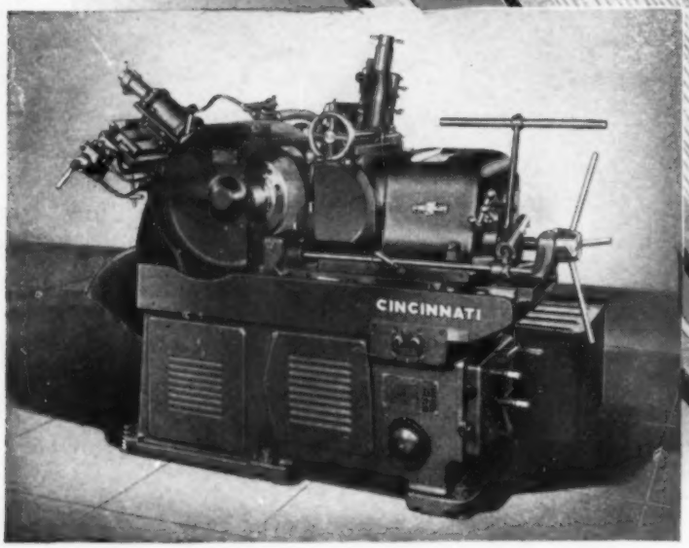
Fellows

ALL OPERATIONS FROM BLANK TO FINISHED GEAR

CINCINNATI

MEMORANDUM

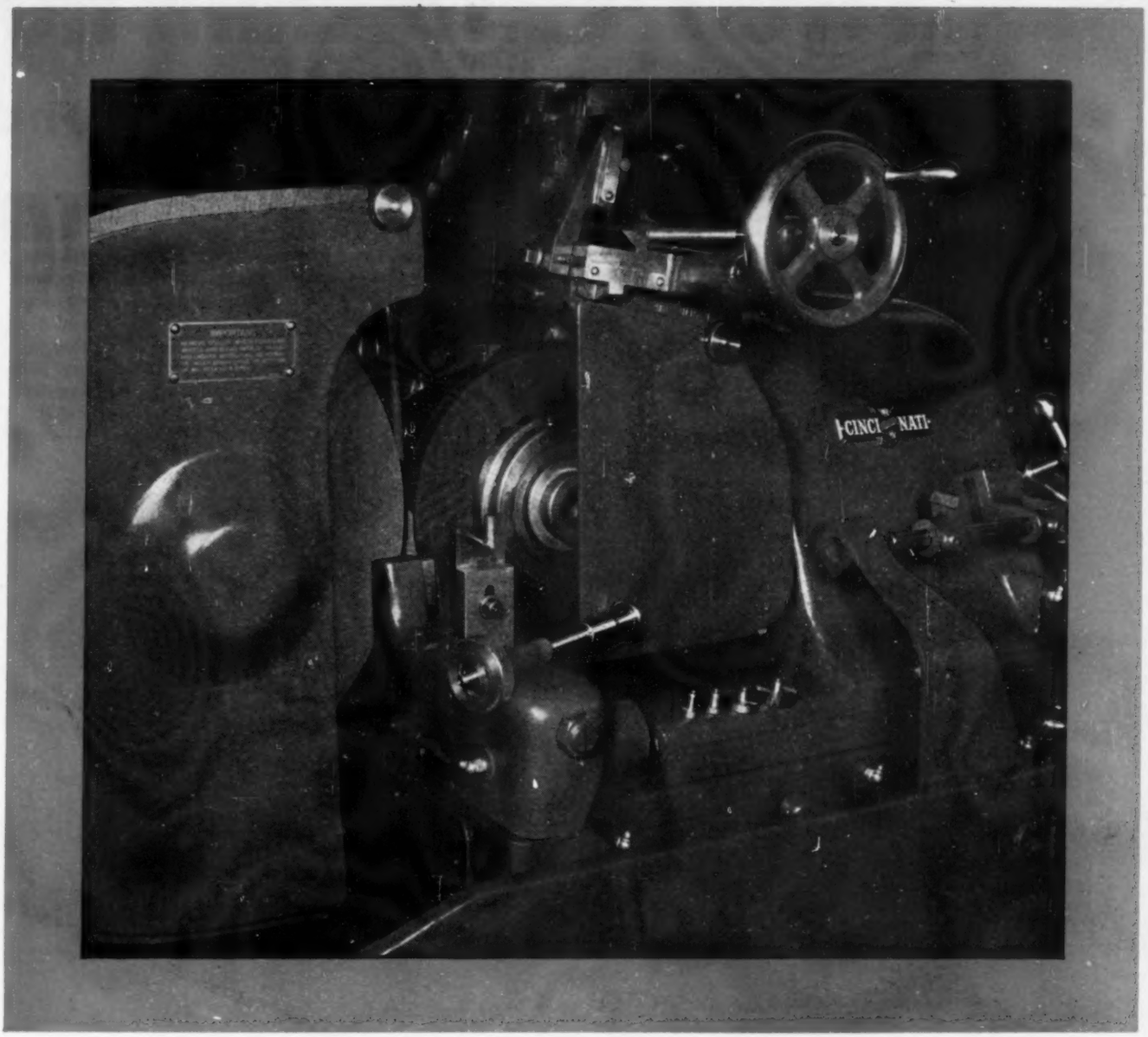
Check this! Family of Four Parts Ground on a Cincinnati Centerless in one Set-up



Illustrated at the left is the CINCINNATI *No. 2 Centerless Grinder. Catalog G-456-3 contains complete specifications. Sweet's Catalog File for Mechanical Industries gives a brief description of* CINCINNATI *Centerless and Centertype Grinding Machines.*

CINCINNATI

CENTER TYPE GRINDING MACHINES



● On this job, the pilot diameter and face of *four different sizes* of flanged buttons are ground on a CINCINNATI No. 2 Centerless *from the one setup* illustrated above. A special loading mandrel, supported between wheels by vee blocks, has interchangeable details for handling the various sizes. With this arrangement, 150 pieces are ground per hour, diameter and face at the same time. The setup is another example of Cincinnati Application Engineering, and shows how easily CINCINNATI Centerless Grinders may be tooled up for a family of parts. These machines are built in three standard sizes (and larger and smaller than standard, too) for handling a wide range of cylindrical and spherical parts in virtually all types of metal and metal substitutes. Why not talk over your grinding operations with our engineers? They will be glad to give you the benefit of more than a score of years' experience in the application of the centerless method to difficult and unusual grinding jobs.

GRINDERS INCORPORATED

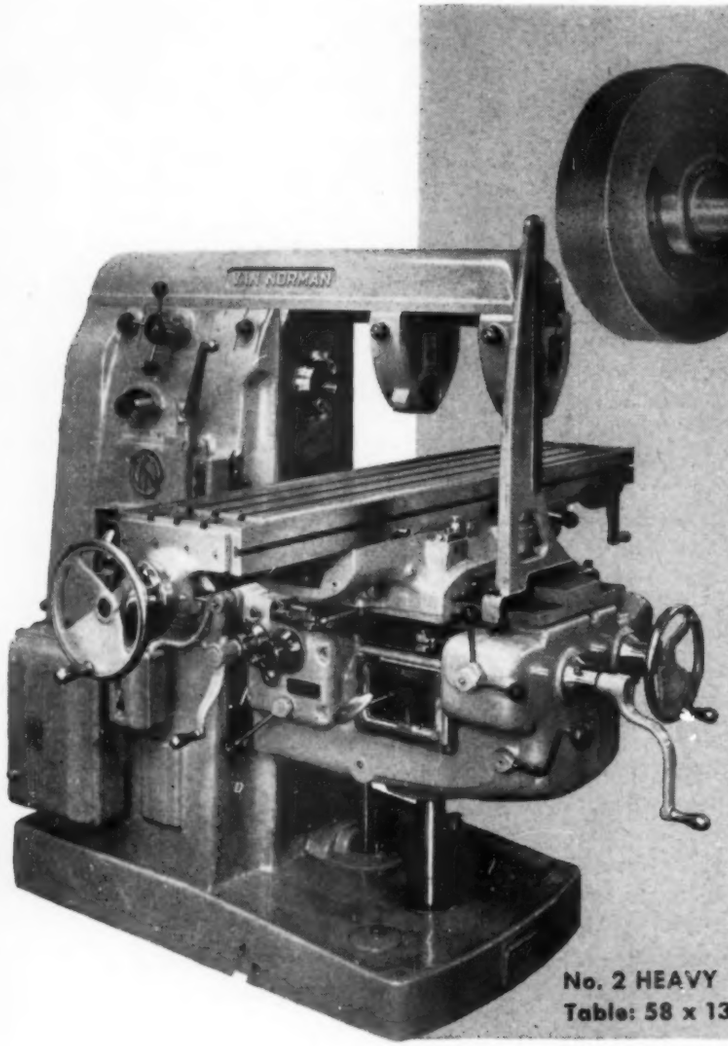
CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

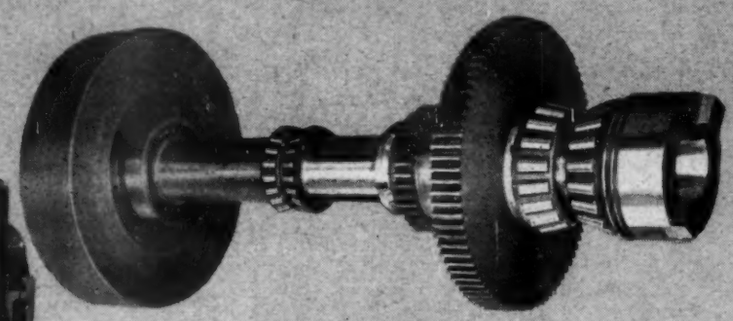
TWO VAN NORMAN HORIZ

that pay production dividends o

No. 2 HEAVY This new heavy-duty miller embodies many design and construction features that give greater ease of operation, utmost accuracy and increased output. Heavy built-in flywheel increases cutability. Front and rear directional power feed controls and six-way rapid traverse, as well as hand adjustments provide ease of operating control. Single lever feed and speed selectors permit instant selection of the proper feed or speed. Hardened alloy steel gears mounted on multi-splined shafts rotating on anti-friction bearings assure long life. Massive knee, saddle and table assembly and heavy scientifically internal ribbed column and base provide maximum ruggedness and dependability. Investigate the No. 2 Heavy for milling of heavy and medium work. Available with Plain or Universal Saddle.



No. 2 HEAVY
Table: 58 x 13 in.



NEW VAN NORMAN SPINDLE DESIGN Provides Maximum Spindle Rigidity, Increases Cutability

Built-in spindle flywheel plus heavy bull gear improve cutability, provide uniform transmission of power to cutter, assuring smooth operation.

Five anti-friction bearings, including double-opposed center spindle bearings provide maximum spindle rigidity under every type of cut.

The spindle design, in combination with the heavy spindle transmission, accures accuracy and precision milling on every type of work-piece.

VAN NORMAN COMPANY

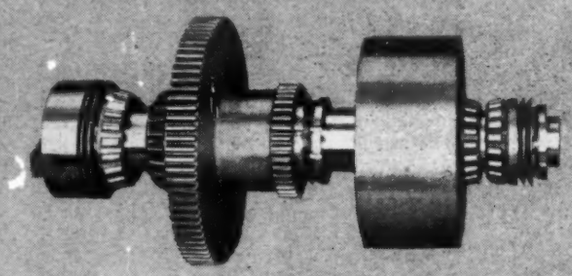
"It Pays to

RIZONTAL MILLING MACHINES

ls on Horizontal Milling Applications

No. 2 MEDIUM

The new No. 2 Medium provides unusual compactness with exceptional rigidity and dependability, assuring smooth operation on all types of cuts. A general purpose machine for medium and smaller parts, it combines rugged strength with extreme sensitivity. Front and rear directional power feed operating controls are at the operator's finger tips for ease of operation. Conveniently located speed and feed selectors provide instantaneous selection with minimum effort. Spindle clutch lever is quickly adjusted to most convenient operation. Pilot wheel permits easy adjustment of ram-type overarm. Automatic lubrication, anti-friction bearings, multi-splined shafts assure long life and accurate performance. The No. 2 Medium is available with plain or universal saddle. Write for information.

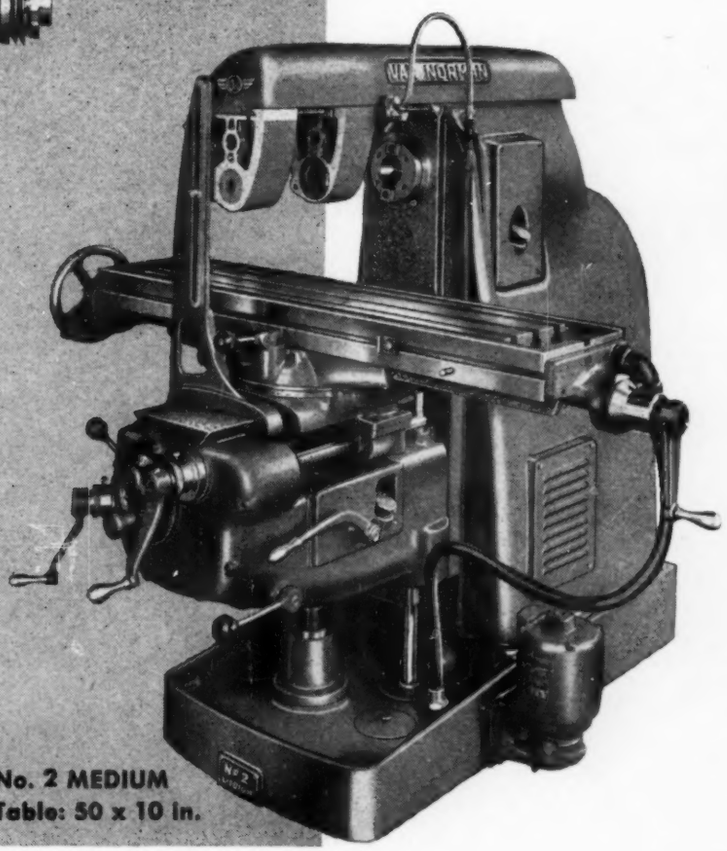


BUILT-IN SPINDLE FLYWHEEL Provides Improved Cutability

Mounted on the spindle inside the column, the heavy built-in flywheel, plus the large bull gear, assure uniform cutting operation by providing smooth transmission of power to the cutter.

Double opposed anti-friction bearings at both front and rear provide maximum spindle rigidity . . . eliminate spindle vibration.

Large alloy forged steel spindle is hardened and ground for accuracy and long life.



No. 2 MEDIUM
Table: 50 x 10 in.

SPRINGFIELD 7, MASS.

Van Normanize"

The LANDMACO Threading Machine is a precision tool capable of handling many threading operations much more economically than the heretofore slower and therefore more expensive methods.

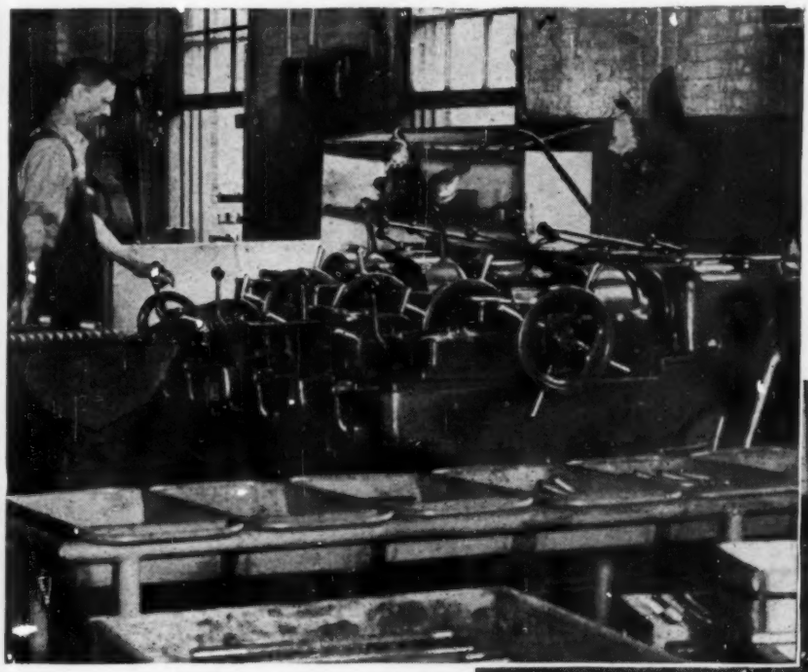
It has many new and exclusive features which combine to assure the greatest possible degree of accuracy, ease of operation and flexibility in making set-up changes.

LANDIS MACHINE CO.

THREADING MACHINES • COLLAPSIBLE TAPS • PIPE THREADING MACHINERY

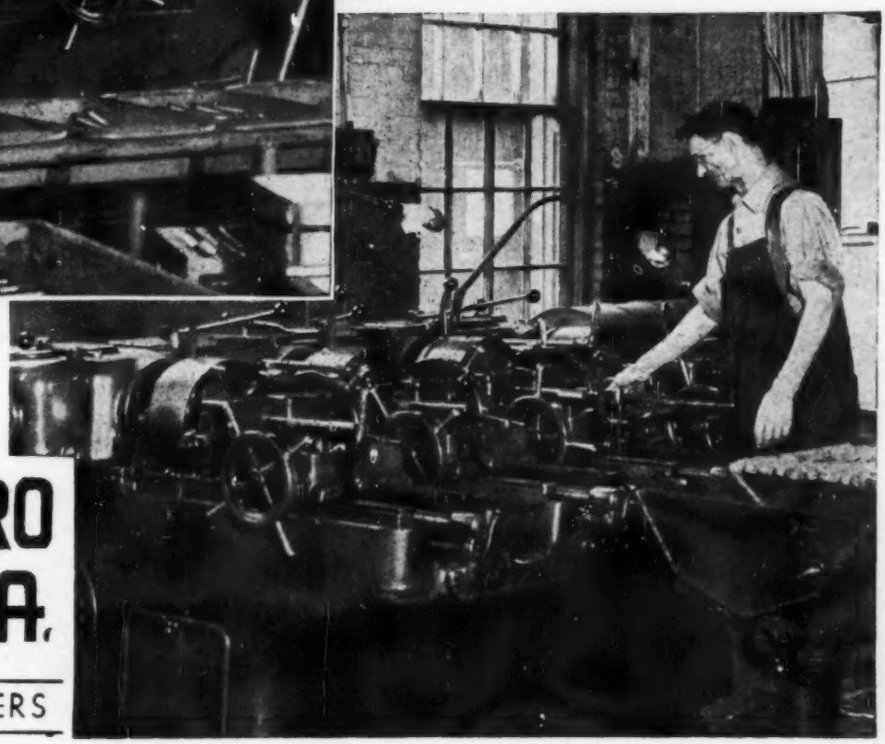
THE LANDMACO THREADING MACHINE ASSURES MINIMUM OPERATING COSTS

The Landmaco Threading Machine is the preference in most railroad shops for threading staybolts, taper head crown bolts, header bolts, etc.—First, because the machine is easily set up—efficient for short run job. Second, it is geared for high threading speeds assuring maximum production. Third, the Landmaco employs the Landis long life Tangential Chaser which reduces tool cost to a minimum by producing more threads per grind and innumerably more threads per set of chasers.



The above facts have been proven in hundreds of installations. May we show you why the Landmaco Threading Machine can be profitably employed on your threading operations.

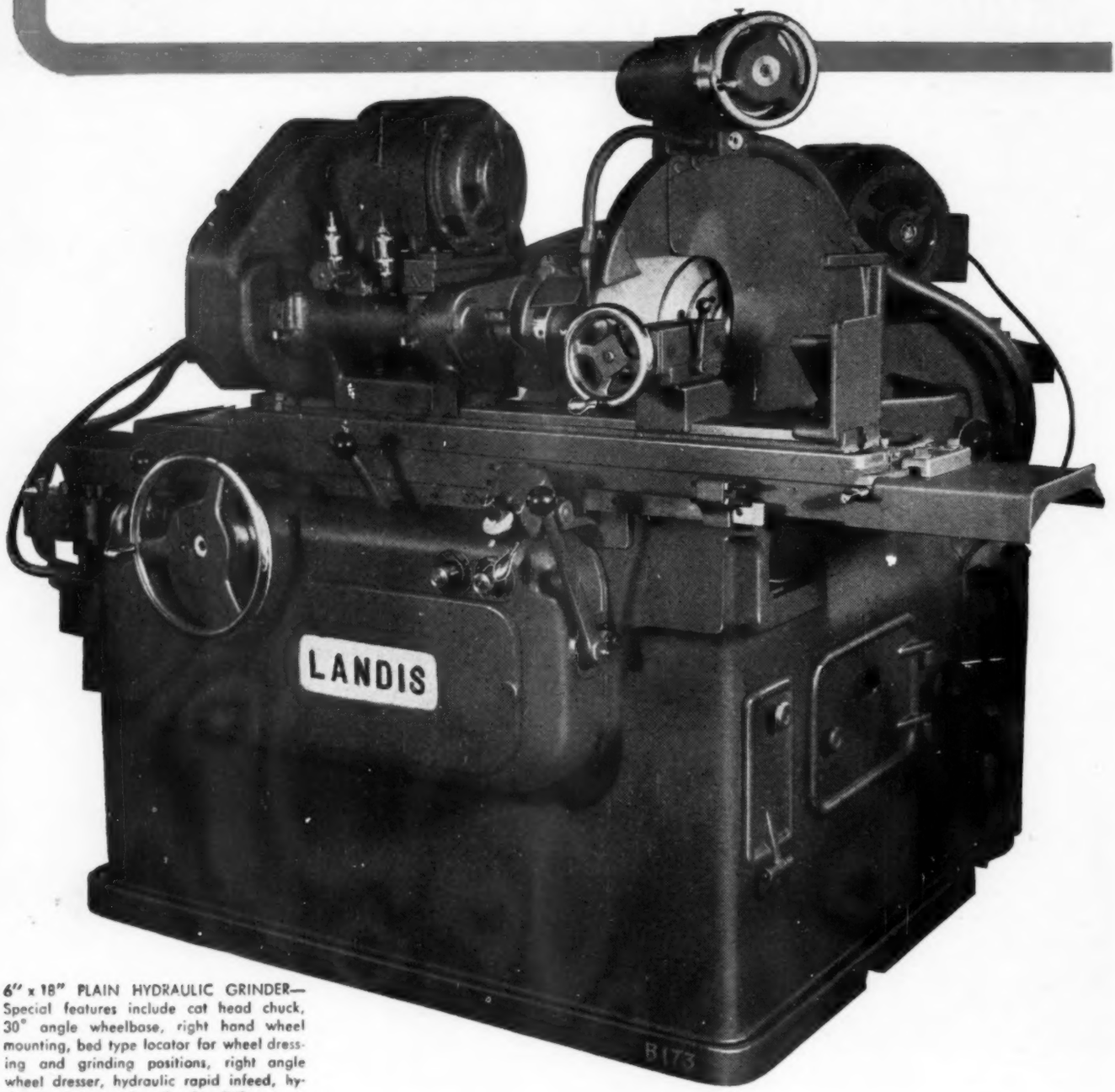
Write for Bulletin No. H-75



WAYNESBORO PENNA. U.S.A.

DIE HEADS · CHASERS

SETUP AND GRINDING TIME CUT 50%



6" x 18" PLAIN HYDRAULIC GRINDER—Special features include cat head chuck, 30° angle wheelbase, right hand wheel mounting, bed type locator for wheel dressing and grinding positions, right angle wheel dresser, hydraulic rapid infeed, hydraulic timing cycle. **Catalog B45**

LANDIS TOOL
Precision Grinders

LANDIS TOOL COMPANY

COSTS LOWERED AND PRODUCTION SPEEDED

ANOTHER EXAMPLE of LANDIS TOOL ENGINEERED GRINDING SERVICE

The grinding of the O.D. of a shoulder and the face of an A.P.I. working barrel valve seat normally required two separate setups and two separate grinding operations.

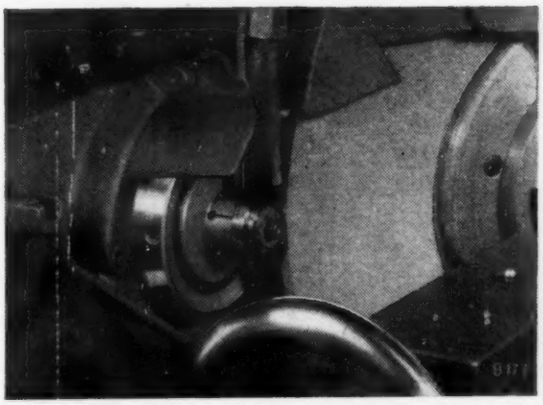
Landis Tool grinding engineers suggested that the two grinding operations be combined by means of an angle wheelbase grinder. This could be done readily by starting with a standard 6" x 18" Type CH Plain Hydraulic Grinder. To mount the wheelbase at an angle the wheel mounting was moved from the left to the right side. A regular cat head chuck provided the work holding fixture. Production was further speeded by the use of the optional hydraulic rapid infeed and hydraulic timing cycle. In this way the two grinding operations were done at once and one setup was eliminated.

Here are the results:

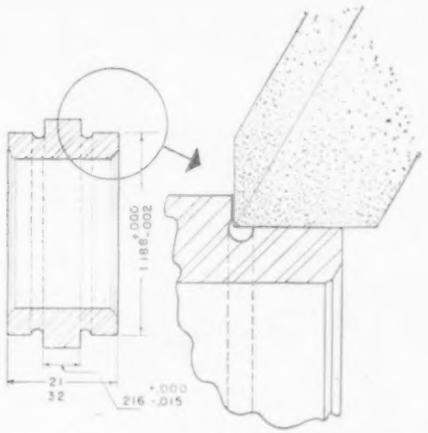
1. Production was more than doubled
2. Unit costs were reduced
3. Machine investment requirement lowered
   - (a) Because two operations combined
   - (b) Modified standard machine used

Whether your grinding problem is simple or complex, you will get a practical low cost solution when you call upon Landis Tool Engineered Grinding Service. Write us for help on specific problems.

CENTERLESS GRINDERS TOO, BY **LANDIS TOOL** ...OF OUTSTANDING NEW DESIGN. WRITE FOR CATALOG T49



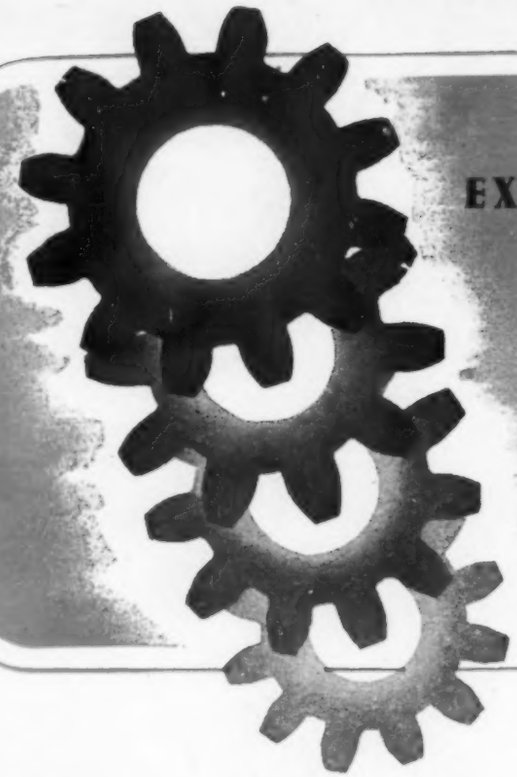
CAT HEAD CHUCK holding valve seat with right hand mounted wheel set at an angle to grind diameter and adjoining shoulder.



Drawing of typical valve seat with diameter and shoulder to be ground on each end. Closeup shows two planes ground at once eliminating a setup. Remove .008"—.012" from O.D and .004" from face. Production 75 complete valves per hour

LANDIS TOOL *Company*

WAYNESBORO, PENNA.



EXCELLENT CHARACTERISTICS
OF SHAVED GEARS

Can be Preserved in Hardening

Gear tooth hardness need no longer be a compromise between machinability and wear resistance. Red Ring Rotary Gear Shaving as the final machining operation on the green gear, during which approximately .001″ of stock is removed from the tooth surfaces, corrects cutting errors of index, helical angle, tooth profile, eccentricity and undesirable tooth roughness.

This corrected gear may then be induction hardened to whatever surface hardness is desired and without objectionable distortion. Hardening without detrimental distortion is frequently accomplished on gears carburized after shaving by quenching in dies and sometimes by liquid carburizing and quenching without dies. No grinding of tooth profile is necessary.

On a 5.145″ P.D. gear so treated, final involute error is held to between +.00015″ and —.00015″; parallelism to .0002″; tooth spacing to .0001″ to .0002″; and accumulated error to .0008″.

WRITE FOR DESCRIPTIVE FOLDER
ON RED RING GEAR SHAVING

Specialists on SPUR AND HELICAL
INVOLUTE GEAR PRACTICE

Originators of ROTARY SHAVING
AND ELLIPTOID TOOTH FORMS

NATIONAL BROACH AND MACHINE CO.

RED RING PRODUCTS

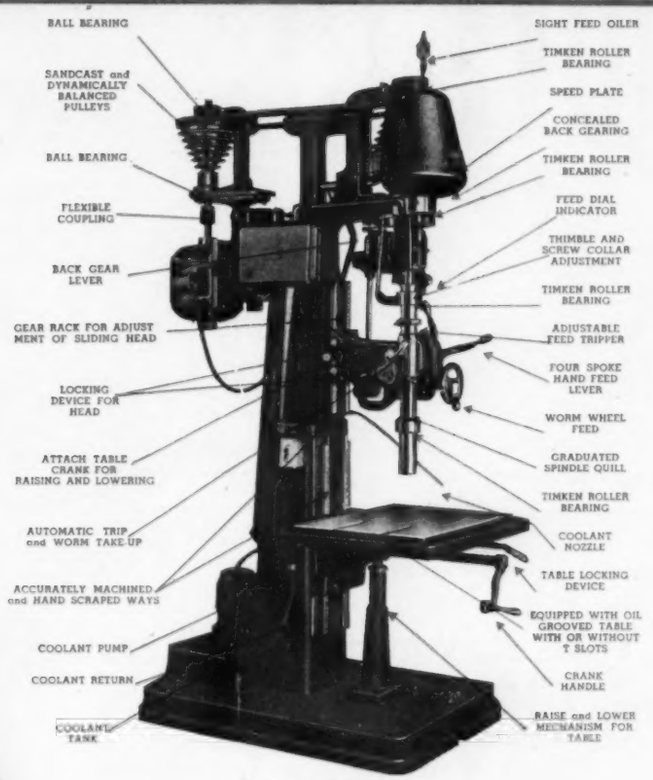
5600 ST. JEAN • DETROIT 13, MICH.

Canedy-Otto

SLIDING HEAD BOX TYPE FLOOR DRILLS

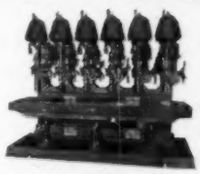
C THE WORLD OVER O

Designed to provide an accurate, fast, sturdy, dependable drill for a moderate initial investment and low maintenance cost. Unit is equipped with anti-friction ball bearings; all castings are seasoned and sturdy; all gears of high alloy steel, accurately machined; all surfaces are hand scraped to a minimum tolerance. Available with V-belt drive — 16 spindle speeds. Power feed of positive, gear driven type. Four rates of feed are obtained through dial knob indicator. Automatic stop for predetermined depth drilling. 21" size — 1¼" capacity.



SINGLE SPINDLE MODEL

21" Box Column Sliding Head Floor Drill



6-Spindle 21" Box Column Sliding Head Floor Drill

4-Spindle 21" Box Column Sliding Head Floor Drill

16" No. 3000 F.V. 1-Spindle Box Column Floor Drill

16" No. 5—10,000 B.V 2-Spindle Bench Drill

14" No. 3000 F.V. 1-Spindle Sensitive Floor Drill

Standardize on CANEDY-OTTO drill presses throughout your shop. The completeness of the CANEDY-OTTO line enables you to do this — to fill all your requirements from this one source. So write today for our catalog describing in detail the many drill presses that bear the CANEDY-OTTO trade-mark — your guarantee of greater value, since 1892.

CANEDY-OTTO MFG. COMPANY

Designers & Manufacturers of the World's Most Complete Drill Press Line
CHICAGO HEIGHTS, ILLINOIS

HOW TO

- MAKE DIFFICULT MACHINING EASIER
- INCREASE WORK OUTPUT
- CUT OVER-ALL MACHINING COSTS
- HANDLE A GREATER VARIETY OF WORK

on your G. & L.

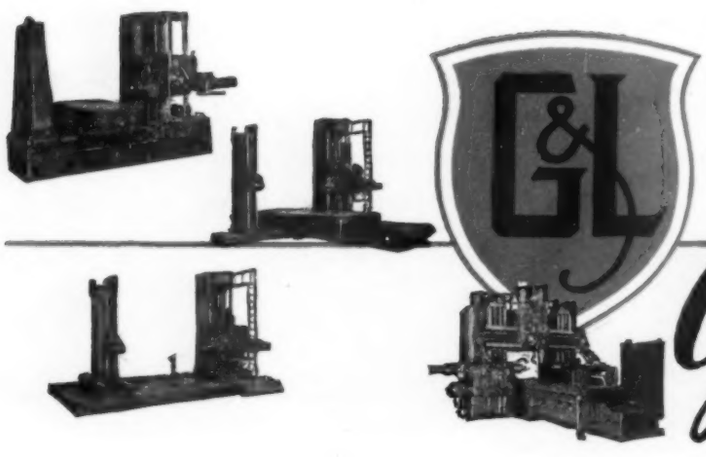
Take Advantage of These Accessories and Attachments That Profitably Increase the Working Range of Standard Machines

It is easier to handle a greater variety of both simple and complex work if your Giddings & Lewis horizontal boring, drilling and milling machine is equipped with time-saving accessories and attachments. Such auxiliary equipment as rotary tables, continuous feed facing heads, angular milling attachments, precision devices, clamping accessories, support and holding attachments, and different boring bars and heads make it possible to increase work output and reduce production costs.

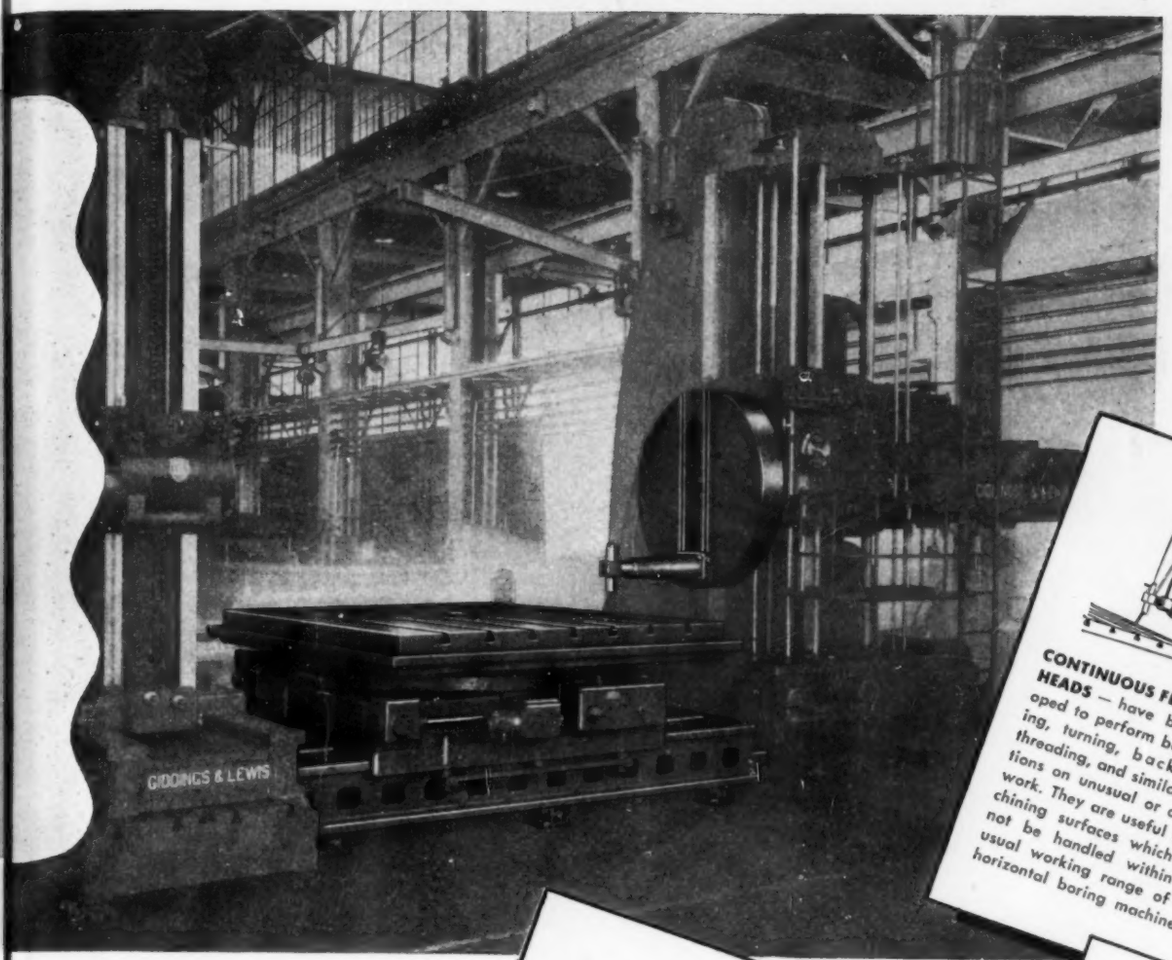
IT'S PROFITABLE TO USE ACCESSORIES AND ATTACHMENTS *IN COMBINATION*

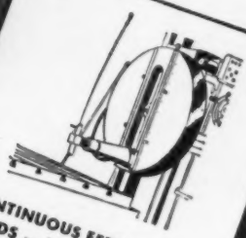
Greater work output at lower cost is possible when accessories and attachments are used together. Rotary tables used with angular milling attachments increase the machine's flexibility and expand its working range.

More than sixty different auxiliary units are available to simplify and speed over-all machining. The purpose, typical applications, structural features and specifications of each are conveniently arranged for you in book form.

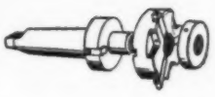


Giddings &

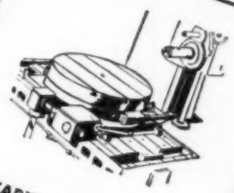




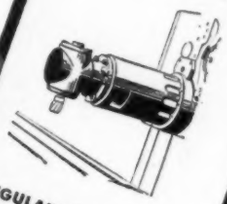
CONTINUOUS FEED FACING HEADS — have been developed to perform boring, facing, turning, backfacing, threading, and similar operations on unusual or complex work. They are useful in machining surfaces which cannot be handled within the usual working range of the horizontal boring machine.



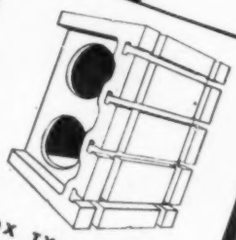
BORING HEADS—of advanced design lend themselves to a variety of boring work. Their use makes it simple to perform repetitive operations quickly and accurately. Uniformity of bore size is maintained.



ROTARY TABLES — are designed to reduce the number of work set-ups. By using any of the plain, power or hand feed rotary tables, numerous work surfaces may be quickly rotated into correct machining position without resetting.



ANGULAR MILLING ATTACHMENTS — will perform a variety of milling, drilling, boring and reaming operations at right angle to the machine spindle. Through their use, a large number of machining operations may be accomplished without disturbing the original work setting.



BOX TYPE ANGLE PLATES — are one of a group of holding attachments which simplify the setting up and machining of certain work. Angle plates provide a solid support and permit setting work on a vertical surface at right angles or parallel to the spindle axis.

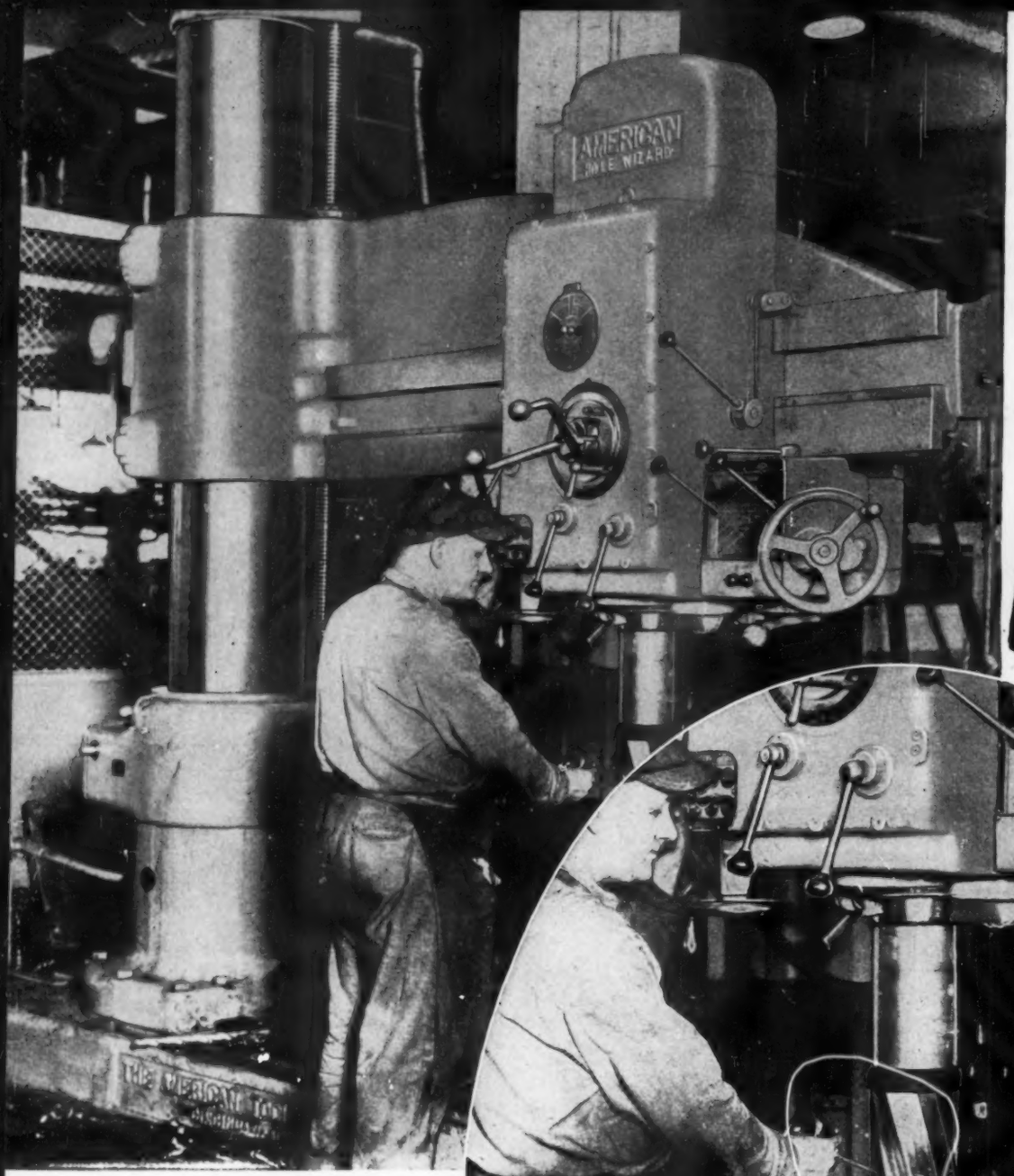
48 PAGES OF WORTHWHILE INFORMATION

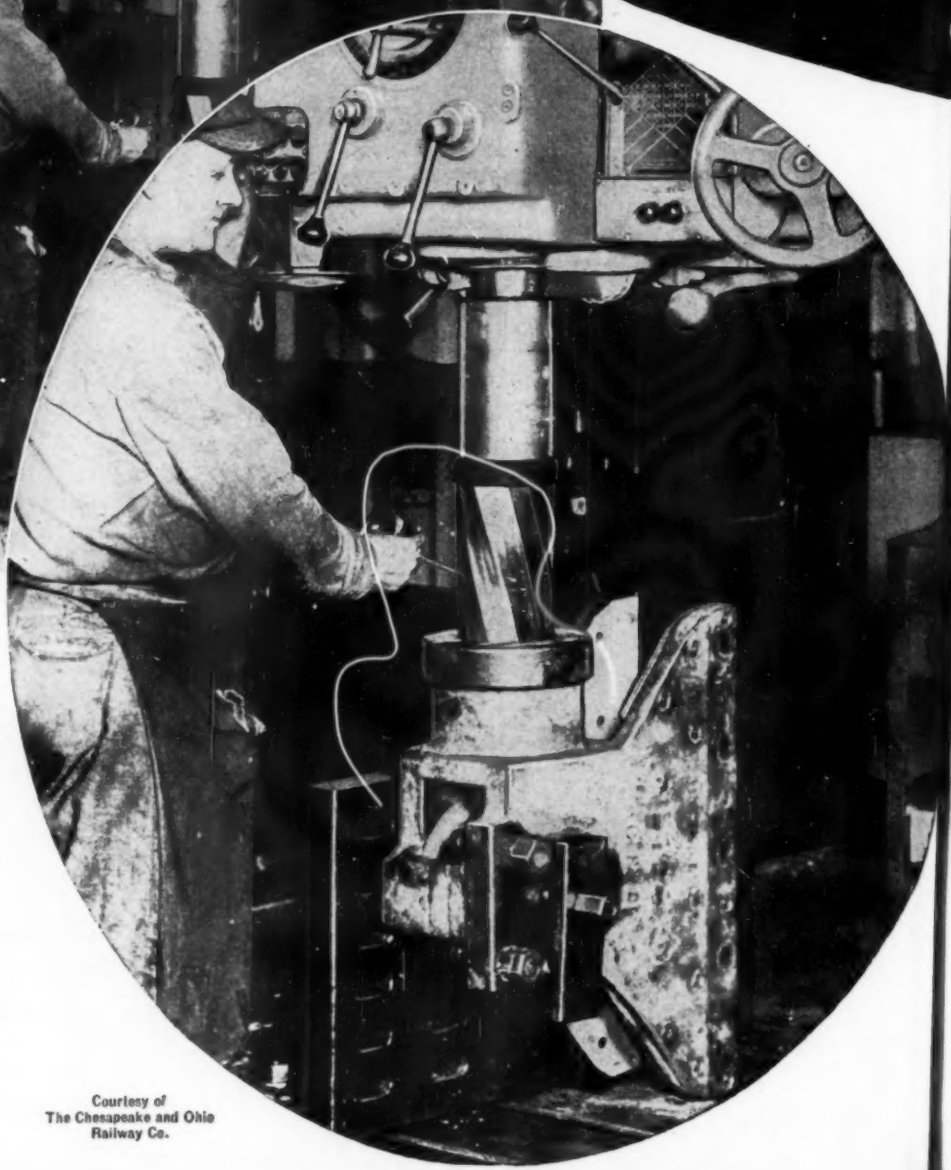
Free

describing G. & L. accessories and attachments and profitable ways to use them. Now is the time to write for your copy — ask for Catalog AM 17.

G&L Lewis MACHINE TOOL CO.

138 DOTY STREET • FOND DU LAC, WISCONSIN





The

Taper reaming locomotive cross heads for piston rod fits.

Courtesy of
The Chesapeake and Ohio
Railway Co.

THE AMERICAN TOOL WORKS C

Acid Test of SPINDLE CONSTRUCTION

Reaming cross heads for piston rod fits is about the toughest job you can find for a radial drill spindle.

This work must be done at slow speeds, without chatter and with a fine finish.

IT'S A TOUGH ONE BUT—

1 **The boring mill construction of the "American" Hole Wizard Spindle does the job. Its 100% anti-friction design with adjustment for wear insures frictionless operation and maintenance of original accuracy.**

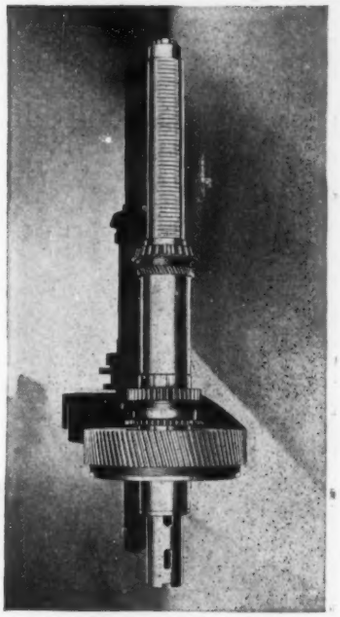
2 **The patented Double Lo-Hung Spindle Drive locates the large diameter driving gear at the bottom of the head close to the work, thus minimizing spindle torque.**

3 **The large diameter spindle, recently increased to add 37% to its rigidity, easily resists the enormous torsional effort imposed by this job.**

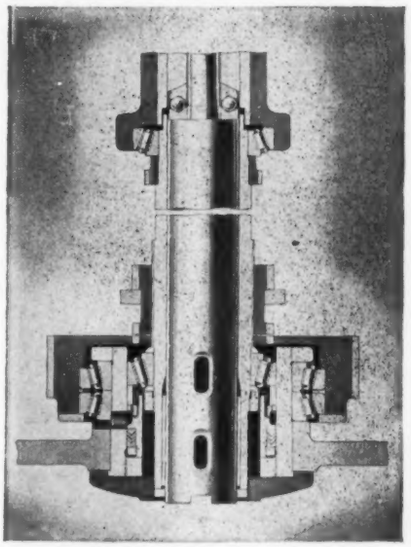
4 **Spindle shake is reduced to an absolute minimum by allowing only .00025" freedom between the ground nitrided spindle and the honed nitrided spindle sleeve. This is especially valuable on accurate boring operations.**

These four spindle characteristics are YOUR assurance that YOUR tough ones will be done easier, quicker and cheaper with an "American" Hole Wizard on the job.

Civilian goods and services must be produced in greater quantities and at lower costs. The "American" Hole Wizard Radial definitely is a contributor to this cause.



Patented Double Lo-Hung Spindle Drive.



Patented Double Lo-Hung anti-friction spindle mounting.

BULLETIN 327 TELLS THE STORY . . . YOURS FOR THE ASKING

C *Lathes and Radial Drills* **Cincinnati, Ohio U.S.A.**

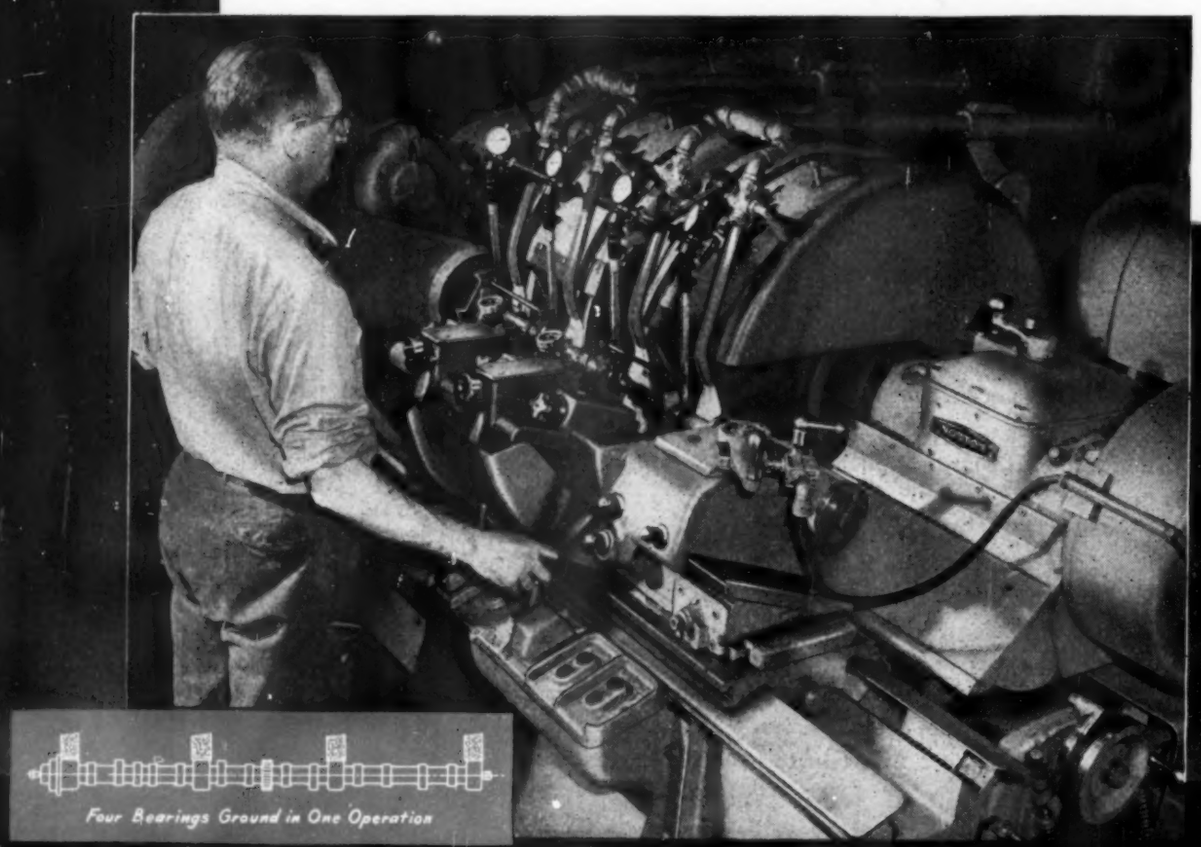
Grinding Camshafts?

The NORTON TWIN-O-MATIC * for Bearings

Bearing grinding on camshafts is an important operation, and pictured below is one of the NORTON 10" TWIN-O-MATIC grinders on the job in one of the nation's foremost automotive plants.

The Twin wheel slides on these machines are independently controlled, permitting the grinding of two to four different diameters *at one time*. Operator attention and effort is reduced to the minimum. Witness the grinding cycle — (1) work is loaded into the machine, (2) the Twin wheel slides are brought forward by convenient fingertip controls, (3) the slides are retracted when size is reached, and (4) the work is removed from the machine. Bulletin #1984 gives further details.

NORTON COMPANY
New York - Chicago - Detroit - Cleveland



Four Bearings Ground in One Operation

NORTON GRINDERS *and Lappers*

M-532

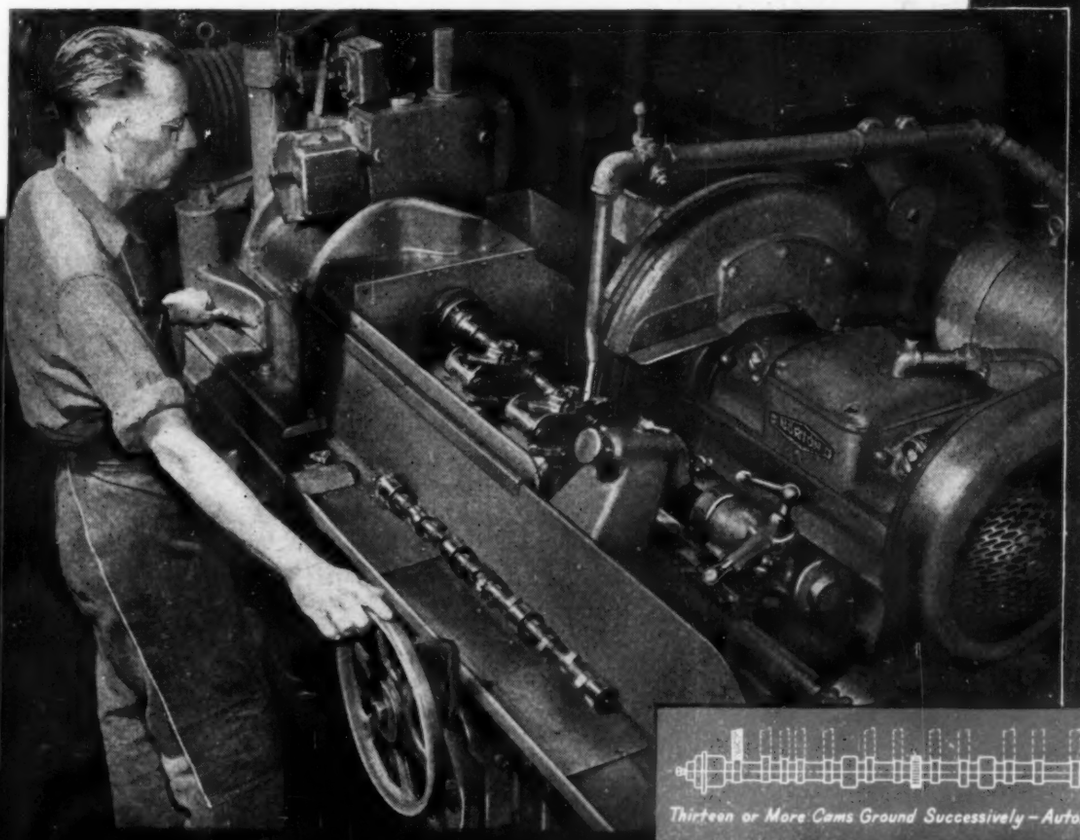
HERE IS A REAL COST-CUTTING COMBINATION!

The NORTON CAM-O-MATIC * for Cams

Pictured below is one of a battery of NORTON CAM-O-MATIC grinders in the same plant.

For minimum costs, the grinding of the actual cam contours themselves must be on a high production basis due to the number of surfaces involved. This highly automatic Norton machine grinds all of the cam contours, and even the eccentric for the fuel pump, in *one handling*. Automatic truing and sizing is part of the grinding cycle. The operator merely loads, starts the machine and then unloads the work, thereby enabling him to operate *two* machines normally, and in some cases up to *four!* Write for Bulletin #2053 for further details.

WORCESTER 6, MASS.
Hartford - *Distributors in all principal cities*



Thirteen or More Cams Ground Successively – Automatically

NORTON GRINDERS *and Lappers*

Trade marks reg. U. S. Pat. Off.

MORSE

that

MORSE No. 1833.
Side Milling Cutter—For general straddle milling, slotting, and side milling.

MORSE No. 1809.
Alternate Tooth Side Milling Cutter—For deep slotting, keyway, and heavy-duty milling. Teeth of alternate right and left hand spiral provide shearing action and eliminate side thrust. Cutting action is smooth and rapid.

MORSE No. 1830.
Plain Milling Cutter—For light, smooth-finish cuts in cast iron, malleable iron, and steel. For slabbing work which is narrower than the cutter.

MORSE No. 1802.
Heavy-Duty Plain Milling Cutter—Ideal for heavy cuts where considerable stock is to be removed.

Makes the Cutters

Make the Most of Time

Morse Milling Cutters are designed to make the most of time by giving *maximum* performance on each job. The result of over 80 years of experience, Morse Cutters are noted for their *consistently long life, smoothness of cut,* and *high return per sharpening.*

Milling Cutters of all kinds are available from Morse. Besides those shown, Morse can supply you with Angle, Convex and Concave Cutters, Woodruff Keyseat and Involute Gear Cutters, as well as any of the other high quality cutting tools in the complete Morse line—End Mills, Reamers, Taps, Dies, and Drills.

Maximum Cutter performance depends upon many factors and only when *all* these are known can the proper Cutter be selected. You can derive the benefit of our experience by letting Morse help you in the selection of the proper Cutter for *your* job. Your Industrial Supply Distributor will cooperate in securing a Morse recommendation.

Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manu

MORSE TWIST DRILL & MACHINE COMPANY

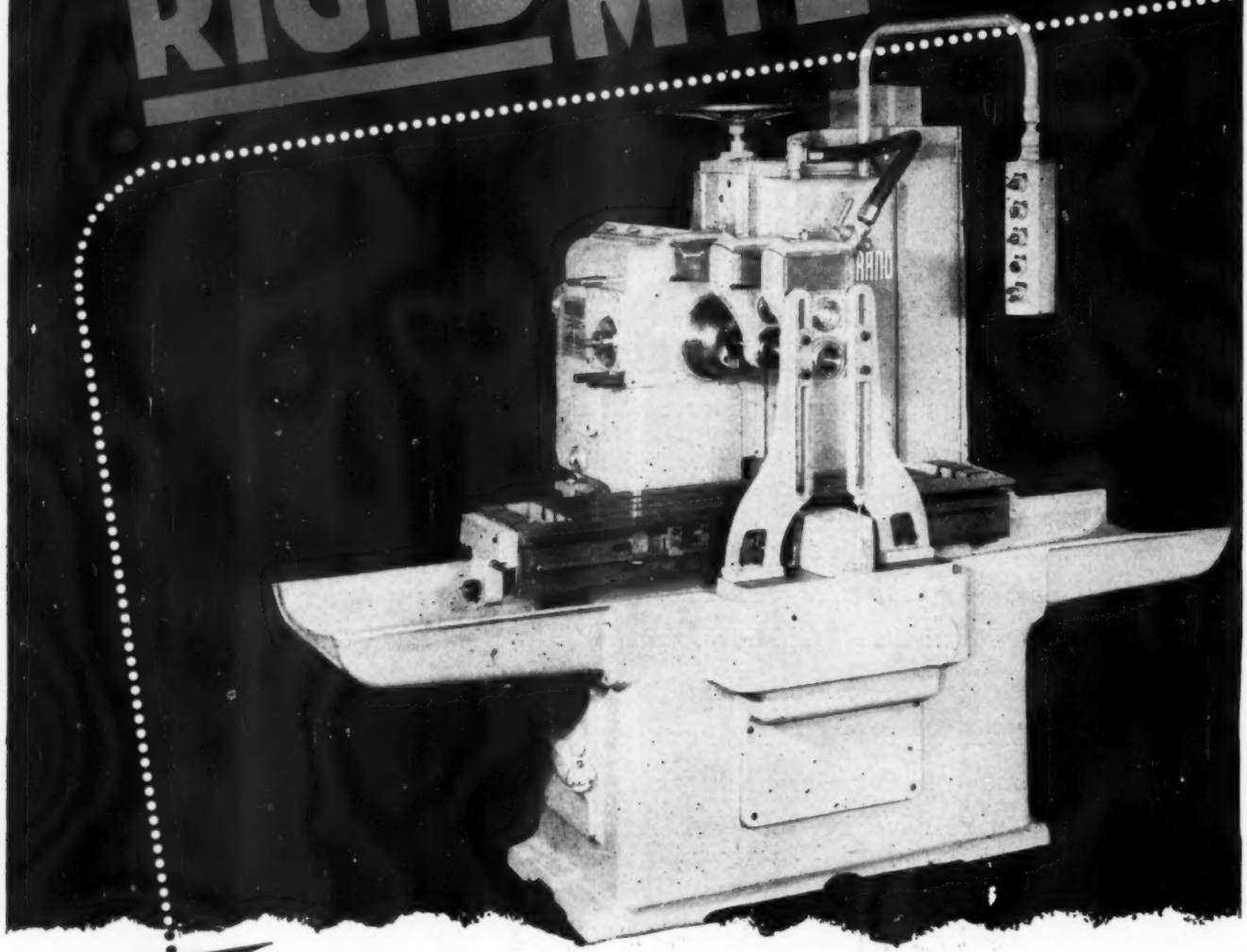
The Original Manufacturer of Twist Drills

NEW BEDFORD, MASSACHUSETTS

NEW YORK STORE: 130 LAFAYETTE ST. • CHICAGO STORE: 570 WEST RANDOLPH ST. • SAN FRANCISCO STORE: 1180 FOLSOM ST.

DESIGNED TO HANDLE COUNTLESS MILLING OPERATIONS AND PROFITABLE METHODS . .

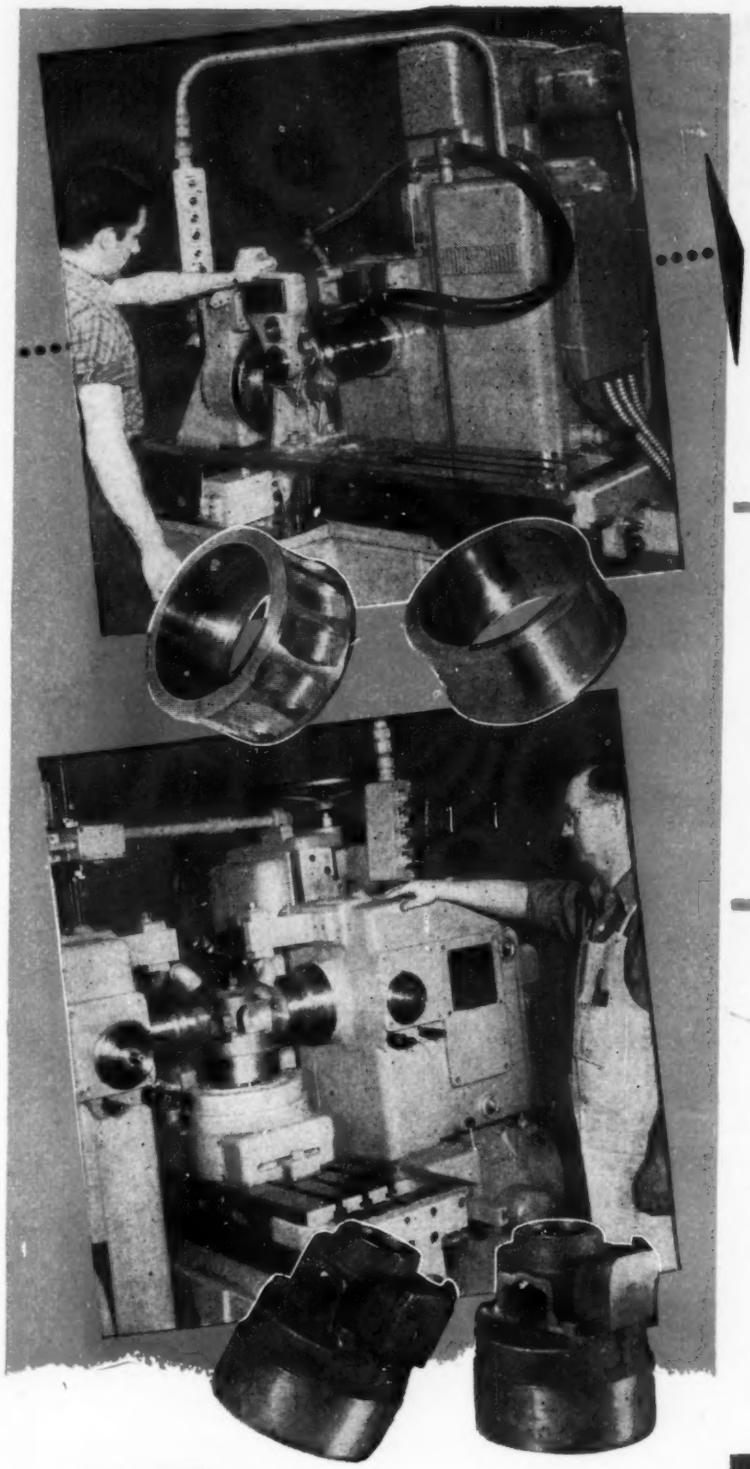
The NEW Sundstrand Model 22 RIGIDMIL



Yes, features like 80 to 1 spindle speed ratio, 100 to 1 feed ratio, 300 inches per minute rapid traverse and Climb and Conventional Milling, are all incorporated in the design of this new Rigidmil. In addition, pendant control facilitates ease of operation and unit construction provides possibilities for duplex type mills and vertical spindles.

Like all Sundstrand Rigidmils, the basic design is such that it can be adapted to countless milling operations and methods. Sundstrand *Engineered Production* offers proper methods and production at minimum cost. Investigate it further now!

RIGIDMILS | FLUID-SCREW RIGIDMILS | AUTOMATIC LATHES | HYDRAULIC EQUIPMENT



STANDARD SUNDSTRAND ATTACHMENTS Add to the Versatility of This Machine

The two jobs illustrated at the left are good examples of the versatility of the Model 22 Rigidmil. This flexibility makes it possible to adapt the machine to a wide variety of milling methods on small and medium size work.

USING AUTOMATIC INDEX BASE

Milling time was cut from three hours per cylinder sleeve to 7.5 pieces per hour. This increased production is due largely to the use of a standard Sundstrand automatic index base in conjunction with a standard vertical feed attachment. These provide a complete automatic cycle for milling 12 grooves in each cylinder sleeve.

DUPLEX TYPE WITH AUTOMATIC INDEX BASE. In this case a standard duplex type Model 22 Rigidmil is provided with a standard Sundstrand automatic index base attachment. Four different surfaces of the compression block are thereby machined in one handling. Two passes of the table completes the milling of all four surfaces. Because one pad is at a different height, the lefthand head is equipped with a standard vertical feed attachment which automatically positions the cutter to the correct height.

MORE FACTS FREE

Get this new booklet today. It contains specifications and additional data on this new Sundstrand Miller. Write today, ask for bulletin No. 156.

SUNDSTRAND MACHINE TOOL COMPANY

2533 Eleventh St. • Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES | **SPECIAL MILLING AND TURNING MACHINES**

EVERY DEMAND FOR SAVINGS IS BEING MET . . .

. . . in "The Tools You Buy Again"

Small tools — at the business ends of machines working to capacity — must be capable of making time, labor and material savings in order that production demands be met. UNION TOOLS are meeting such demands in the countless plants turning out war materiel. They are saving time by faster cutting — saving labor by requiring less resharpening — conserving material by assuring accuracy and minimizing spoilage.

The ability of UNION TOOLS to make savings is traceable to an in-built fineness of quality which in turn is the result of UNION'S long, specialized experience in small tool development.

For the sake of savings, it will pay you to standardize on UNION.

Twist Drills — Milling Cutters — Reamers — Hobs — Slitting Saws — End Mills — Taps — Dies — Screw Plates — Profile Cutters.

•

UNION
TWIST DRILL COMPANY
Athol, Mass.

STORES New York Store: 61 Reade St.; Los Angeles Store: 524 East Fourth St.; Chicago Store: 11 So. Clinton St.; Seattle Store: 568 First Ave., So.; San Francisco Store: 121 Second St.; Detroit Store: 5527 Woodward Ave.

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S. W. Card Mfg. Co., Div.; Mansfield, Mass.
Butterfield Division, Derby Line, Vt., and Rock Island, Quebec

UNION

The CONE AUTOMATIC MACHINE COMPANY

sees many

GOOD THINGS AHEAD

It is reported that . . . . . .

Westinghouse calls its new steel encased motor the most revolutionary change in construction in 58 years and states that it delivers up to 134% more power per pound than previous motors.

get ready with CONE for tomorrow

Federal Telephone and Radio Corporation will conduct experiments with television, FM and radar in a building at Nutley, N.J., which will be completely shielded from atmospheric electricity.

be ready with CONE for today

Called the world's largest, a spot welder that can make 48 welds at a single stroke is in use at Pullman-Standard Car Manufacturing Co.

get ready with CONE for tomorrow

A division of Reynolds Metals Company has a new line of all-aluminum bicycles and scooters.

be ready with CONE for today

Raytheon Mfg. Co. has an electronic kitchen range. The food is put in a disposable dish and quickly cooked by the energy from a magnetron tube.

get ready with CONE for tomorrow

Bell Telephone Laboratories report that they have developed a tube that will send a hundred million words per minute by telegraph.

be ready with CONE for today

The Army Air Force has contracted with Fairchild Engine and Airplane Co. for fundamental research in the use of atomic energy in aircraft.

get ready with CONE for tomorrow

Aluminum Co. of America has recently supplied a 100-foot all-aluminum span for a railroad bridge at Massena, New York.

The Souhegan Mills of Wilton, N. H., believes that its molded board, made of shavings, can compete in price and utility with plywood or lumber.

be ready with CONE for today

The U. S. Bureau of Mines finds that Freon II is more effective in fighting gasoline fires than any of the other gases tested.

get ready with CONE for tomorrow

Patent 2,404,206 has been granted for a method of mining practically pure copper by dissolving it chemically and accumulating it electrolytically.

be ready with CONE for today

Nylon drive ropes are said by Plymouth Cordage Company to reduce machine shut-downs.

The behavior of piston rings and oil films has been studied by the National Advisory Committee for Aeronautics by using a glass engine cylinder.

get ready with CONE for tomorrow

When their new 2-million volt machine is installed, Babcock and Wilcox Co. will have 12 X-ray machines in use for checking steam generating equipment.

be ready with CONE for today

Blaw-Knox has built two 23-cubic yard clamshell buckets for unloading coal on Lake Superior. They weigh nearly 14 tons apiece and are believed to be the largest of their kind.

get ready with CONE for tomorrow

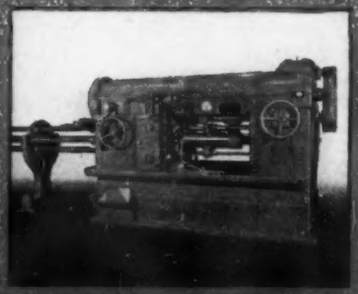
Scientific American prophesies that the use of silicones will bring about a revolution in surface finishes comparable to that resulting from the development of nitrocellulose lacquers.

FOLLOW THESE PAGES FOR NEWS OF PROGRESSIVE PRODUCTION

Give soft jobs to *any* Automatic

put the *tough* ones on a CONE

From 65 mm 3312 stock, a 2¾" Six Spindle Conomatic, with 13 HSS tools, produces the part shown here in 71 seconds.



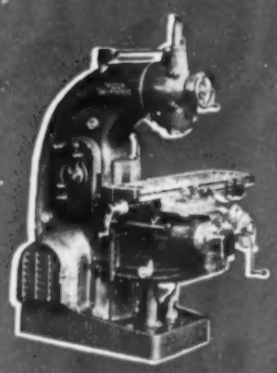
Ask your CONE representative to show you our new color motion picture

CONE

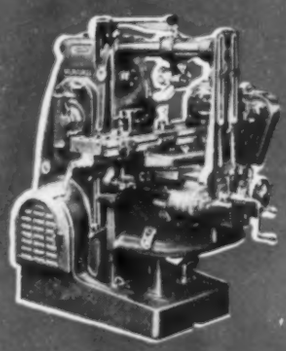
AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

36

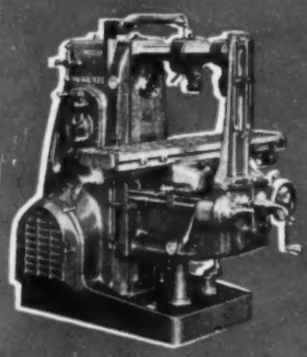
Big Choice Gives



MODEL 1H Swivel Head Vertical —Also available in Plain, Universal, Automatic Cycle Plain and 18" Manufacturing types.

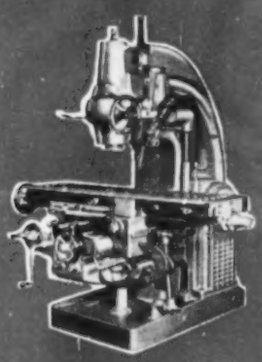


MODEL 2HL Universal — Also available in Plain and Swivel Head Vertical types and in Automatic Cycle Plain type.



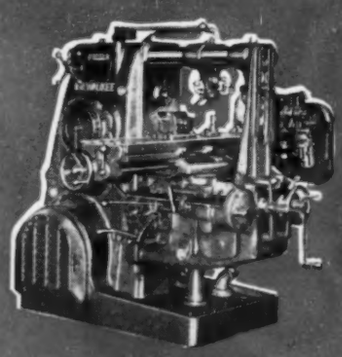
MODEL 2H Plain—Also available in Universal and Vertical types and in Automatic Cycle Plain and Vertical types.

MODEL 3H Universal—Also available in Plain and Vertical types and in Automatic Cycle Plain and Vertical types.

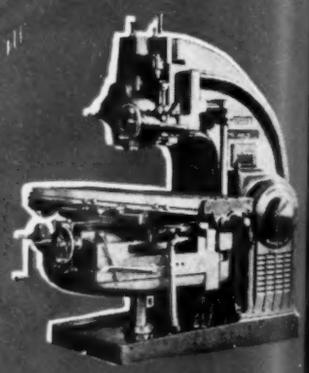


MODEL 2K Vertical Automatic Cycle—Also available in Plain and Vertical types and in Automatic Cycle Plain type.

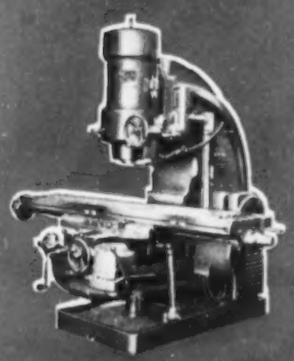
MODEL 3KM Plain—Also available in Universal and Vertical types and in Automatic Cycle Plain and Vertical types.



MODEL 3K Universal—Also available in Plain and Vertical types and in Automatic Cycle Plain and Vertical types.



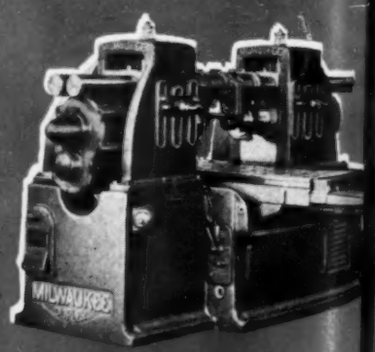
MODEL 4K Vertical—Also available in Plain and Universal types and in Automatic Cycle Plain and Vertical types.



MODEL 50 CSM Vertical — Also available: Plain and Automatic Cycle Plain and Vertical types. Choice of 2 working ranges.

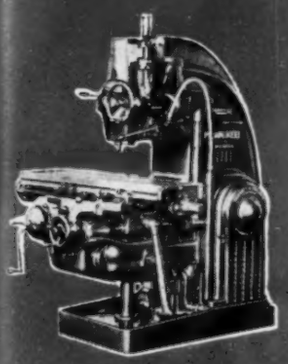
MODEL M-24 Simplex—Available with 18" - 24" or 30" longitudinal travel to table — in Simplex models only.

MODEL 1200 Simplex — Available in both Simplex and Duplex models with 24" 36" or 48" longitudinal travel to table.

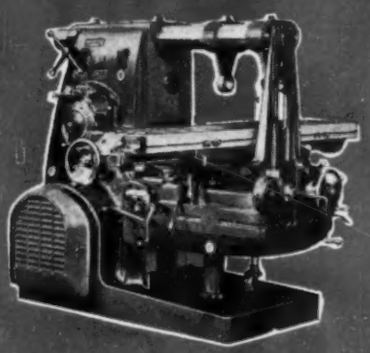


MODEL 1800 Duplex — Available in both Duplex and Simplex models. Choice of 24" 36" 48" or 54" longitudinal travel to table

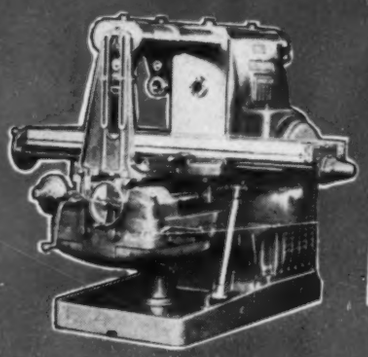
s You Better Buy!



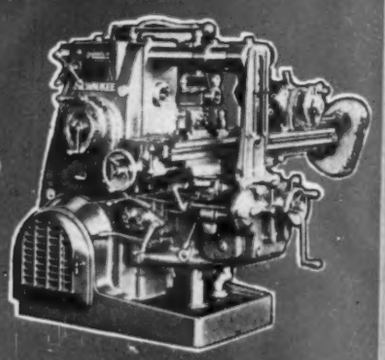
MODEL 4H Vertical—Also available in Plain and Universal types and in Automatic Cycle Plain and Vertical types.



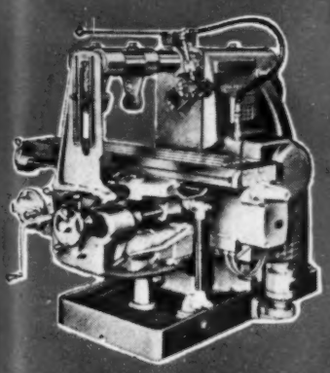
MODEL 5H Plain—Also available in Universal and Vertical types and in Automatic Cycle Plain and Vertical types.



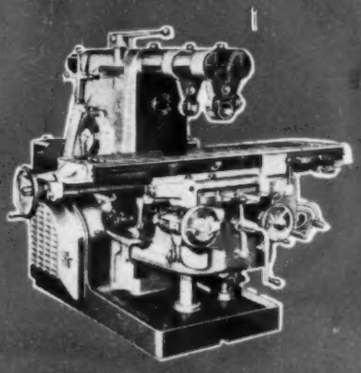
MODEL 5HM Plain—Also available in a Vertical Model machine with identical working ranges as the Plain model.



MODEL 2KM Universal—Also available in Plain and Vertical types and in Automatic Cycle Plain and Vertical types.

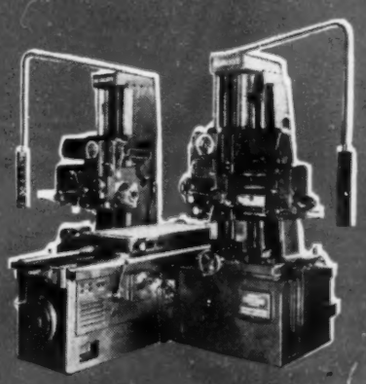


MODEL 20 CSM Plain—Also available in Vertical and Automatic Cycle Plain and Vertical types. Choice of 2 working ranges.



MODEL 30 CSM Plain Automatic Cycle—Also available Plain, Vertical and Automatic Cycle Vertical types. Choice of 2 working ranges.

MODEL 2D Rotary Head Milling Machine—One size and working range only. Especially suited to precision tool and die work.



MODEL No. 3TT Precision Milling and Boring Machine—Also available in single column and headstock model—No. 3T.

Kearney & Trecker

Milwaukee Milling Machines—99 Different Models, Sizes and Types mean the right machine for your job

There's a Kearney & Trecker for every milling job—in small shops, high production plants or precision tool rooms. Horsepowers range from 3 to 50 with wide working ranges and broad feed and speed ranges to suit.

Model K machines are general all-purpose machines. Model H machines are the intermediate type. The new CSMs are the most powerful standard milling machines ever built—specifically designed for carbide milling of steel, but suited for all-purpose work as well. For high speed production you can get the Manufacturing types in conventional, Simplex and Duplex models.

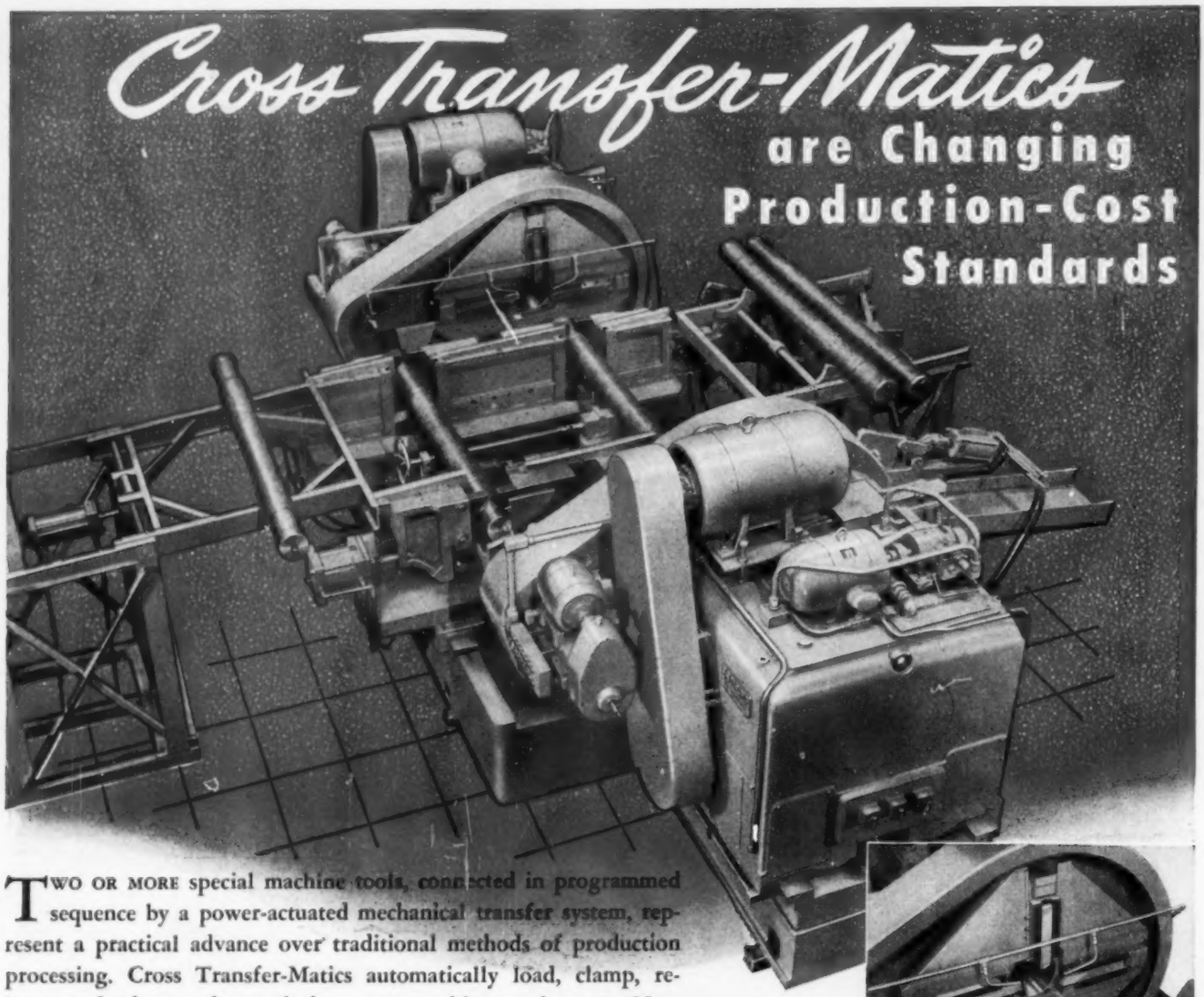
You'll find the Rotary Head Milling Machine and Models No. 3T and 3TT Precision Milling and Boring Machines are ideal for the specialized shop. To meet unusual or special machine requirements, there's Kearney & Trecker Customer Engineering Service where you get the benefit of nearly fifty years experience in precision and production machine tool design and manufacture.

Catalog E-53 gives you complete data on our entire line—Write for it! Please indicate your business connection.

KEARNEY & TRECKER
CORPORATION
Milwaukee 14, Wisconsin

474

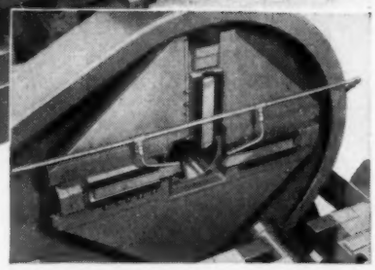
Cross Transfer-Matics are Changing Production-Cost Standards



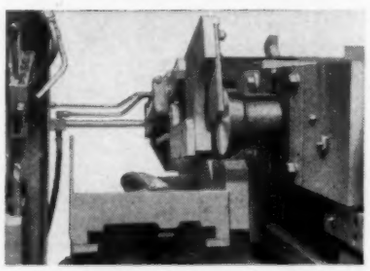
TWO OR MORE special machine tools, connected in programmed sequence by a power-actuated mechanical transfer system, represent a practical advance over traditional methods of production processing. Cross Transfer-Matics automatically load, clamp, release, and advance the work from one machine to the next. *Now* an attendant simply presses a button—and the line completes the job. Error is minimized because human skill is not involved. You get lower cost per piece because productivity is greater; man hours are lower; production is mechanically paced, therefore constant.

The 60,000-pound cut-off and centering machine shown is one of a Cross line of five units designed and built for machining various sizes of railroad car axles weighing up to 1,400 pounds each. The crop at each end is cut off in the first station; the previous axle is being centered in the next station. The work does not rotate. Axles progress automatically through subsequent operations which include turning the journals and wheel-seats, and smooth-finish facing both ends to length.

The potential value of Cross Transfer-Matics is receiving the endorsement of those concerned with obtaining highest productivity and lowest cost per piece. Cross experience and ingenuity can help in utilizing your manpower to the best advantage.



The rotating tool head is used to cut off the surplus stock (crop) on the ends of the axle. Carbide tools are used. The upper tool pierces the scale ahead of the two parting tools.



The floating shear is automatically positioned. Its blade shears off and disposes of the crop, after the parting tools have reduced the stock to a small diameter.

THE **CROSS** COMPANY

Established 1893

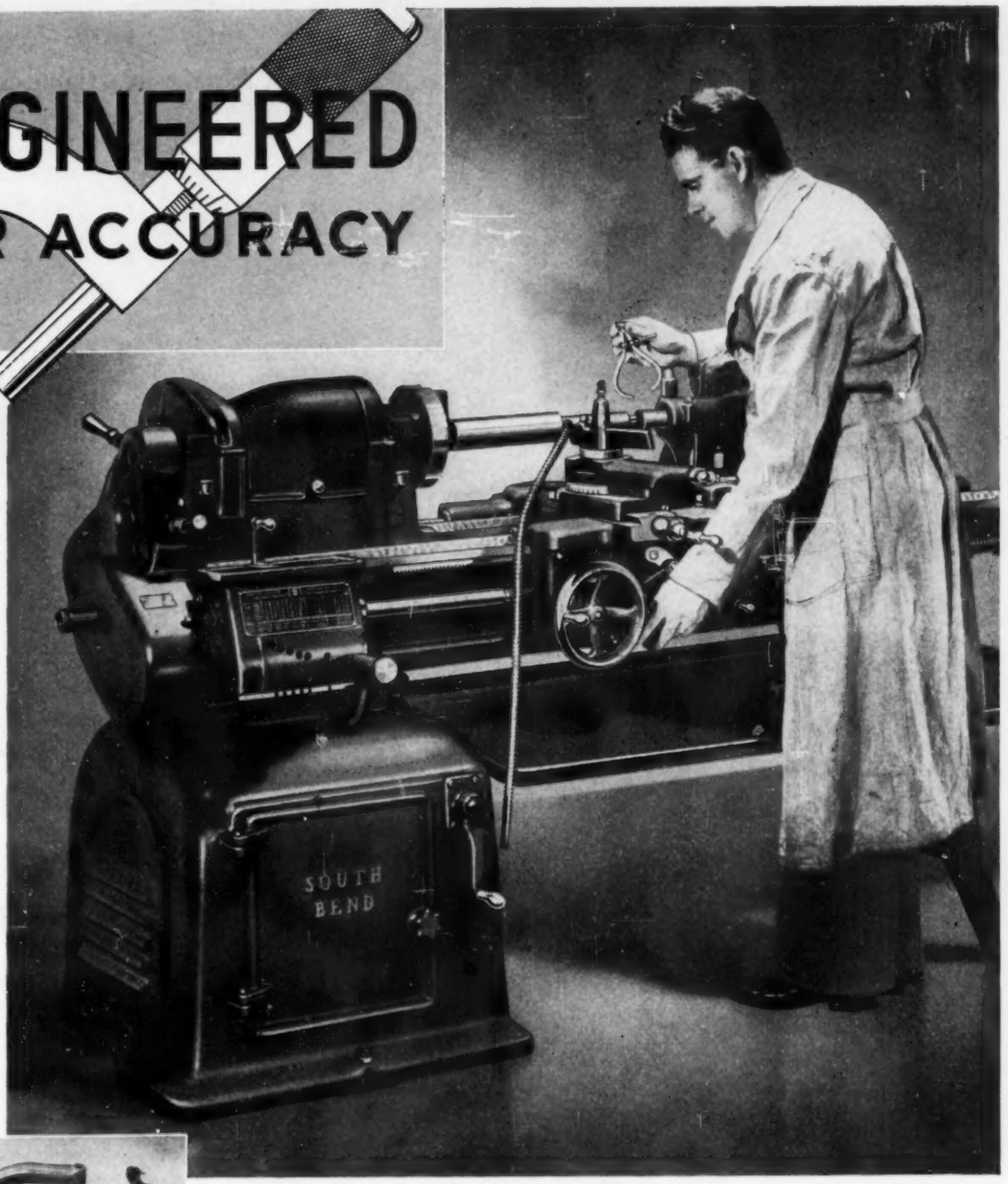
©1946—THE CROSS COMPANY

SPECIAL MACHINE TOOLS

DETROIT 7, MICHIGAN

MILLING • DRILLING • TAPPING • BORING • TURNING • SHAPING • GRINDING • HONING

ENGINEERED FOR ACCURACY



14-1/2" x 5' South Bend Quick Change Gear Lathe. Price, less electrical equipment and chip pan, f. o. b. factory,
$1095.00

BROADEN THE SCOPE OF YOUR LATHES

South Bend Attachments and Accessories simplify and speed tooling, often save delay and expense of making special fixtures. Shown above is the Handlever Draw-in Collet Attachment. Write for illustrated Catalog No. 77 which shows all South Bend Attachments and Accessories.

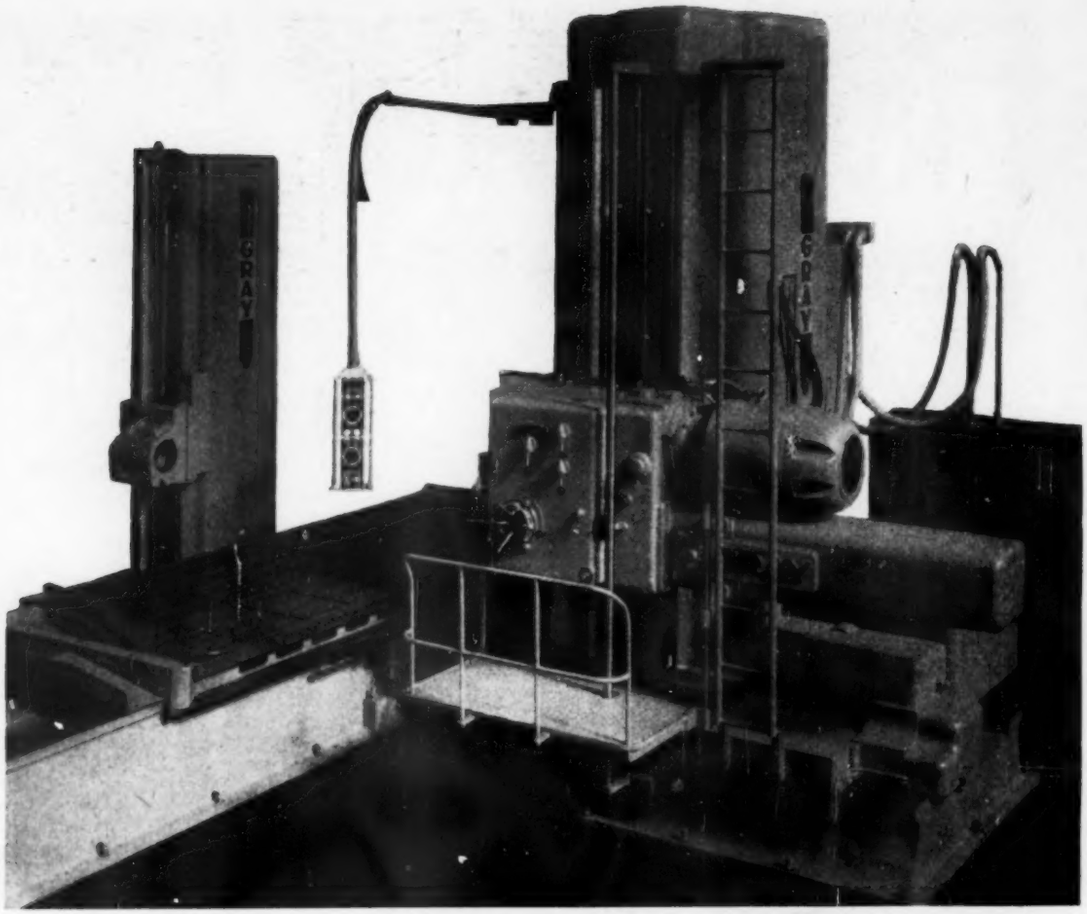
South Bend Lathes are engineered to meet exacting needs for precision accuracy in all types of industries, and to maintain their accuracy year after year, even under strenuous production conditions. Accuracy and long life are built into South Bend Lathes as carefully and surely as they are built into fine timepieces. Correct design based on nearly forty years of research and experience, quality materials specially selected for specific needs, expert craftsmanship, strict inspection through all phases of production and assembly, and thorough testing to rigid working tolerances before shipment, guarantee dependable performance in laboratory, toolroom, production shop, and maintenance department.

South Bend Engine Lathes and Toolroom Lathes are made with 9", 10", 13", 14½", and 16" swings, and bed lengths to 12'. Turret Lathes are made with collet capacities to 1". Write today for free 68-page catalog which illustrates all sizes and models, gives detailed specifications, and shows all attachments and accessories. Ask for Catalog 100-D.

SOUTH BEND LATHE WORKS

419 EAST MADISON STREET • • SOUTH BEND 22, INDIANA

LATHE BUILDERS SINCE 1906



Announcing the new GRAY

PLANER TYPE HORIZONTAL BORING, DRILLING and MILLING MACHINE

Remember

"A Machine Tool is no better than its ways. There is no adequate substitute for the GRAY NON-METALLIC WAY."

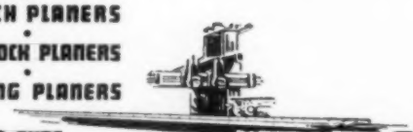
This machine combines outstanding convenience of operation with unusual power and the rigidity to make that power really effective.

24 spindle speeds in geometric progression, any one instantly available. Feed independent of speed, and electronically controlled.

The simple pendant switch gives you fingertip control from any operating position.

Write for fully illustrated descriptive Bulletin No. 54

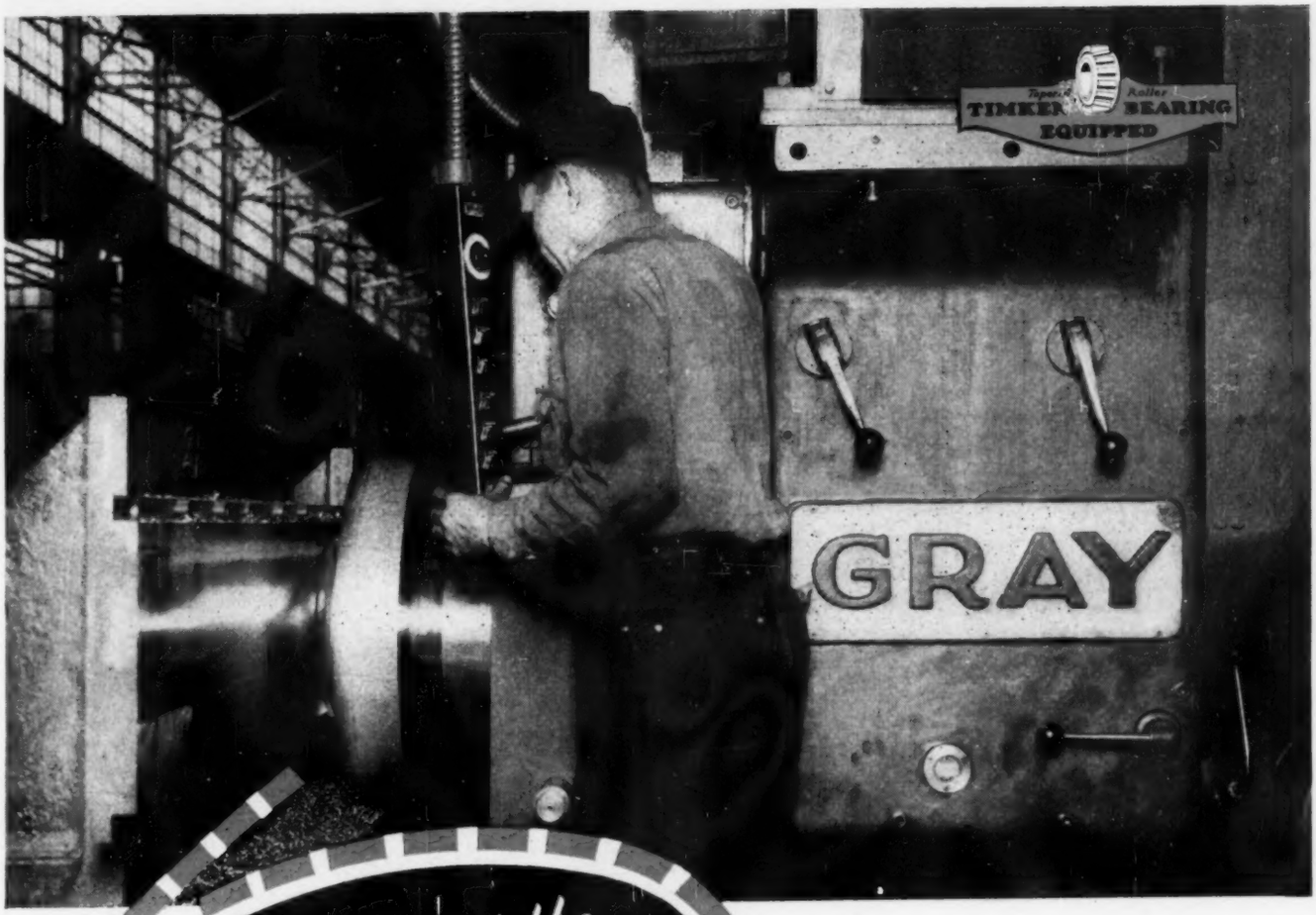
DOUBLE HOUSING and OPENSIDE PLANERS
•
SWITCH PLANERS
•
DIE BLOCK PLANERS
•
MILLING PLANERS
•
PLANER TYPE MILLING MACHINES
•
HORIZONTAL BORING MACHINES



The G.A. GRAY *Co.*

CINCINNATI 7, OHIO, U. S. A.

Sold in Canada by Upton, Bradeen and James Ltd. ● Sold in Latin America by Machine Affiliates.



that's spindle RIGIDITY

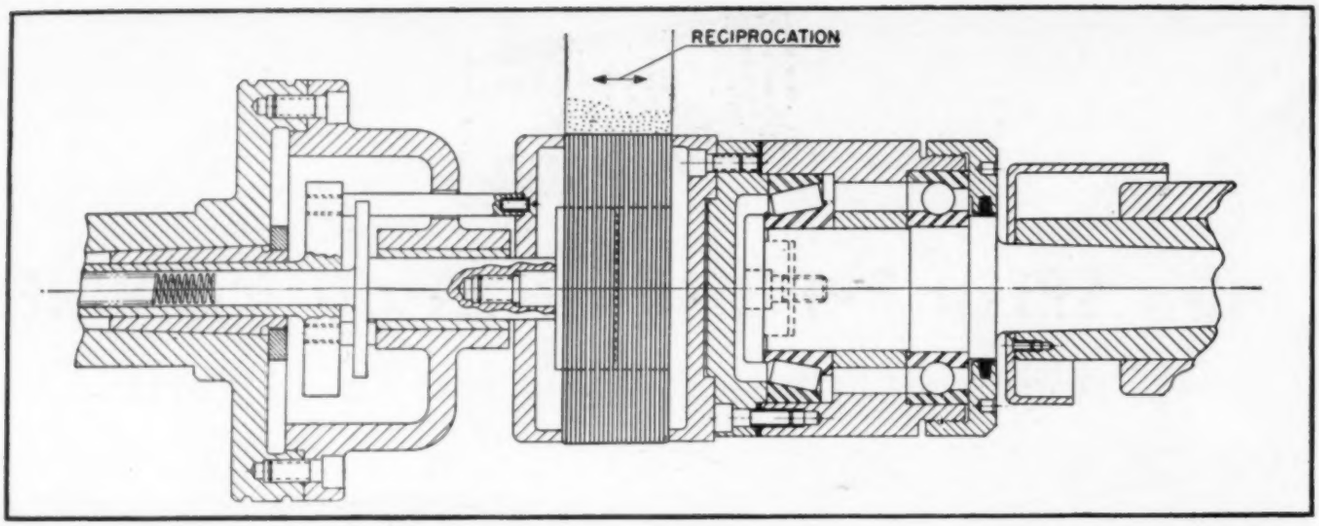
The above close-up photograph of a Gray 50 H.P. Traveling Head Milling Machine was made while the machine was in actual operation. The carbide-tipped cutter is so steady and clear cut that you might think it was photographed standing still, instead of revolving at unusually high speed.

There is a reason — the spindle is mounted on Timken Tapered Roller Bearings, as also is the drive sleeve. High-speed negative angle milling of steel requires an unusually rigid, vibrationless spindle drive. Like other machine tool manufacturers, The G. A. Gray Company relies upon Timken Bearings for the ultimate in performance.

To be sure of getting Timken Bearing precision in your machines, look for the trade-mark "TIMKEN" on every bearing you use. The Timken Roller Bearing Company, Canton 6, Ohio.

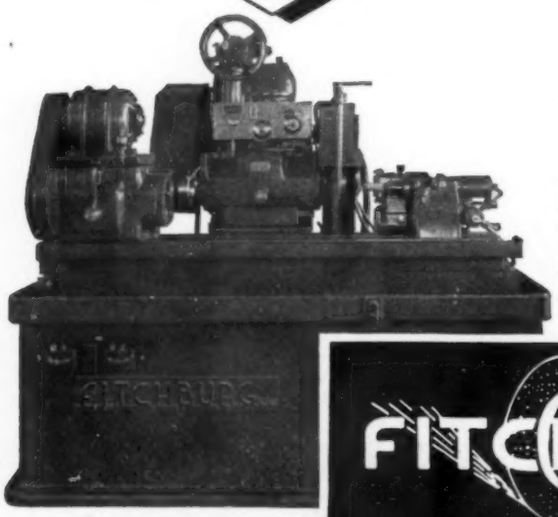
Manufactured by G. A. Gray Company, Cincinnati, Ohio.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS



THIS IS THE WORK...

THIS IS THE MACHINE...



Profitable Cylindrical Grinding by the FITCHBURG "Push-Button" method

Grinding the O.D. (4.375 ± .002") of Laminated Stator Cores

THE WORK:

Two FITCHBURG 6" x 24" Bowgage Plunge-Cut Grinders, Center Type, are being used in the plant of a motor manufacturer to grind the outside diameters of stator cores. The cores consist of punchings riveted together, the inside diameter being previously ground on another machine.

As shown above, centering is accomplished by sliding the core onto a spring-loaded centering plug. The headstock holding and driving fixture is a hydraulic type which equalizes the holding pressure and maintains the core in the correct grinding position relative to the wheel.

The ball-bearing tailstock center is attached to a hydraulic footstock. Adapters grip the punchings almost to the outside edge to prevent flaring of the punchings during the grinding operation.

WHAT THE OPERATOR DOES:

1. Slides the core onto the centering plug.
2. Throws over a hydraulic footstock hand valve. (This advances the tailstock center and causes the adapters to grip the punchings.)
3. **Pushes the "START" button** and turns to a *second* similar machine.

WHAT HAPPENS AT THE PUSH OF A BUTTON:

1. The work *automatically* starts revolving.
2. The Bowgage Wheelhead Unit *automatically* goes through its complete cycle:
   a. Wheel rapidly traverses to the work.
   b. Grinding feed diminishes as final size is reached.
   c. Wheel reciprocates 1/32" during entire cycle.
   d. Wheel rapidly returns to starting position.
   e. Wheelhead controls reset themselves *automatically* for the next complete cycle.
3. As the wheel draws away, the work *automatically* stops rotating. (Throwing the hydraulic footstock hand valve draws the tailstock away from the work, allowing the work to be removed and the next piece slid onto the centering plug.)

ONE OPERATOR CAN EASILY RUN 2 GRINDERS.

THIS PRODUCTION IS ON A 25 SECOND CYCLE, PER MACHINE — OR 300 PER MAN-HOUR.

If it's round ... and to be ground ... in mass-production quantities ... at a low cost per piece ... investigate FITCHBURG'S "PUSH-BUTTON" GRINDING.

FITCHBURG GRINDING MACHINE CORP.

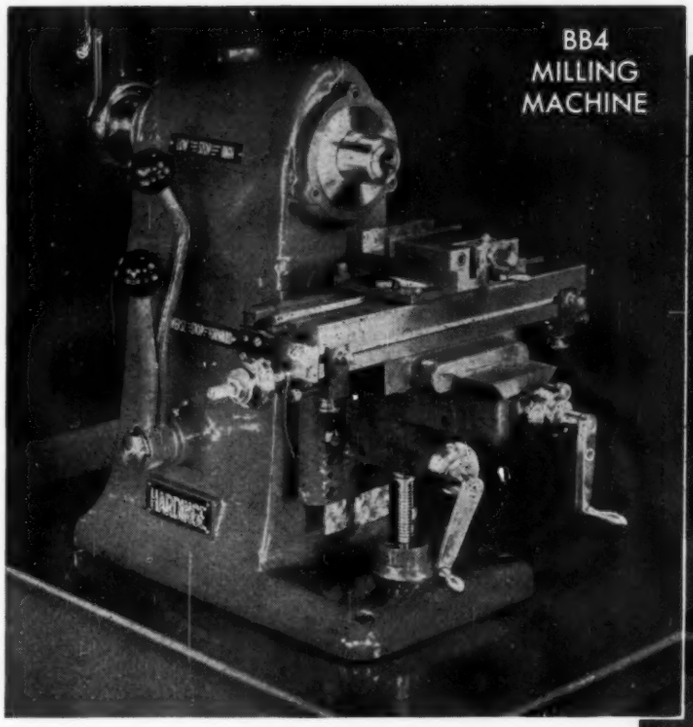
FITCHBURG, MASSACHUSETTS, U. S. A.

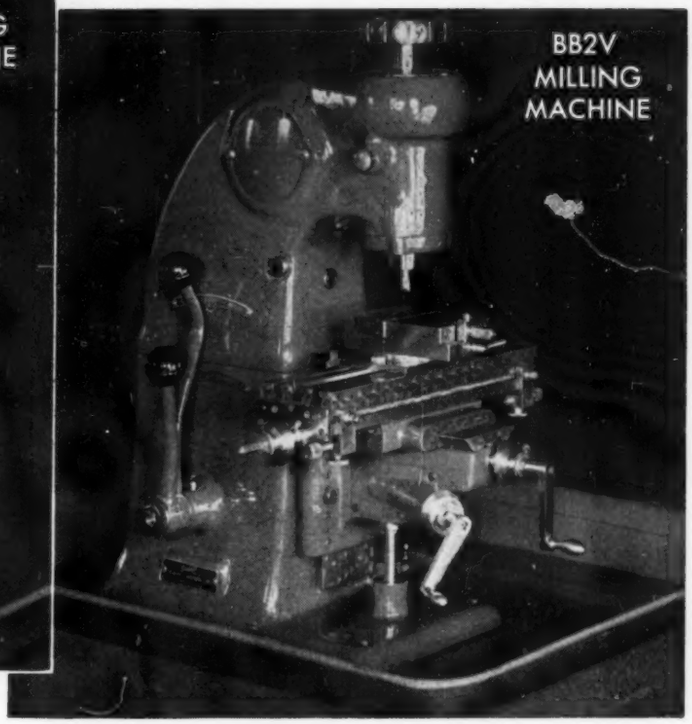
Manufacturers of — Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

HARDINGE
ELMIRA, N.Y.

HIGH SPEED PRECISION MILLING MACHINES

Provide Greater Economy for Small Parts





Vertical or Horizontal—any way you look at it—closer proportion in the size of the machine tool to the size of the work means greater efficiency.

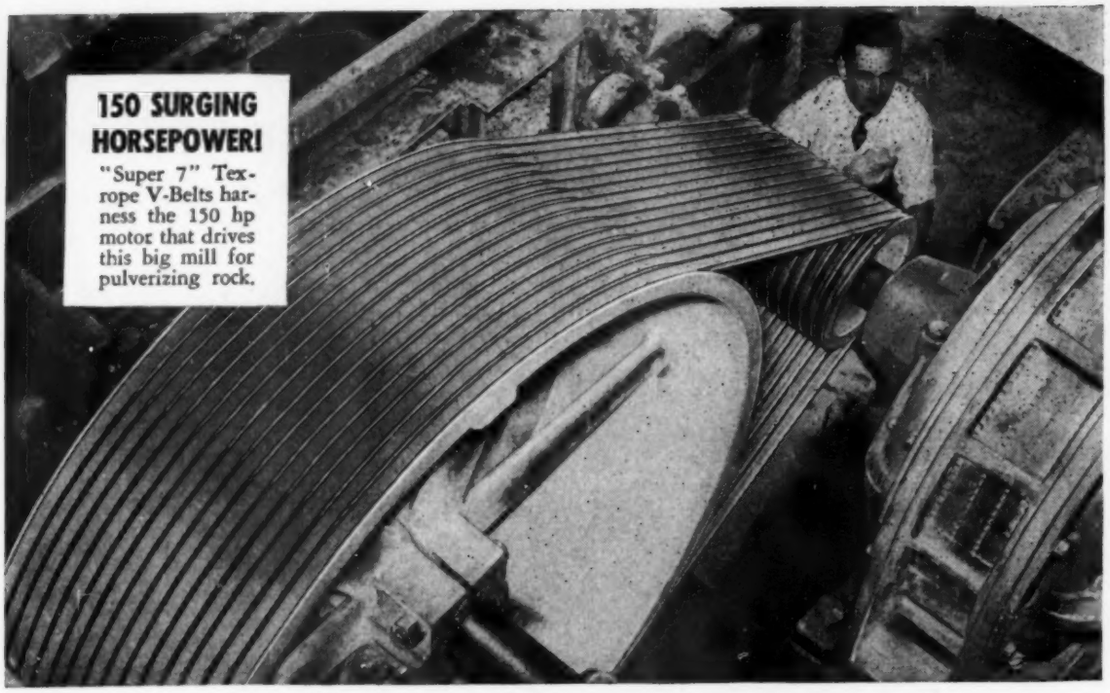
HARDINGE Precision Milling Machines are small, compact and designed to do a volume job on small parts. For a low, original investment, the HARDINGE Milling Machines can release large equipment that is really too cumbersome for small work . . . and parts manufacturing costs can be reduced.

Utilize the advantages of HARDINGE Precision Milling Machines for small-size work in production, tool room and development departments. Write us today for counsel in the application of HARDINGE Precision Milling Machines to your work.

Table size, both machines, 12" x 3 3/16". BB4 has ¾" collet capacity, eight speeds to 3000 r.p.m. BB2V has ½" collet capacity, eight speeds to 5000 r.p.m.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

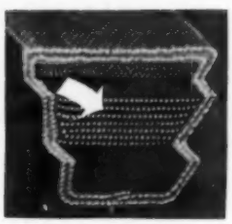
"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"



150 SURGING HORSEPOWER!
"Super 7" Texrope V-Belts harness the 150 hp motor that drives this big mill for pulverizing rock.

PULLING POWER

. . . one of the 7 Great Features in "Super 7" Texrope V-Belts!



1. STRONGER CORDS give "Super 7" Texrope V-Belts their great pulling power. These long-fibre, hard-twisted cotton cords have the strength of high-test fish lines. Laid row on row and imbedded in heat resistant rubber compound, they provide a powerful load-carrying element.

2. TOUGHER COVER. Rugged duplex construction protects the carcass of "Super 7" belts from wear and dirt.

3. HEAT RESISTANCE. *All* "Super 7" V-Belts are designed and built to give high resistance to heat.

4. SHOCK ABSORBING. "Super 7" construction combines great strength with the degree of resiliency necessary for long belt life and smooth power transmission.

5. PRECISION CURED in pressure molds to assure accurate section and perfect bonding of cords, cover and cushion.

6. ACCURATELY MATCHED. Every belt weighed, measured and carefully inspected before being sized and packed.

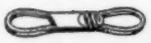
7. ENGINEERING LEADERSHIP. "Super 7" Texrope V-Belts represent 27 years of research and experience — by Allis-Chalmers, originator of the Multiple V-Belt Drive.

• • •

There are FIVE types of "Super 7" Texrope V-Belts, to meet every operating requirement: *Standard — Heat Resisting — Oil Resisting — Oil Proof* — and *Static Resisting*. Call your Allis-Chalmers office or dealer. ALLIS-CHALMERS, MILWAUKEE 1, WIS.

A 2161

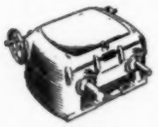
TEXROPE .. Greatest Name in V-Belt Drives



"Super 7" V-BELTS
Five Types — Sizes to suit every power transmission job.

Texsteel, Texdrive, "Magic-Grip"
— sheaves in a full range of sizes, grooves.

"Vari-Pitch" SHEAVES
Exact variations in speed, stationery or motion control.



SPEED CHANGERS
Speed variations up to 375% at the turn of a crank.

ENGINEERING
Finest V-Belt engineering talent in the world—at your call.

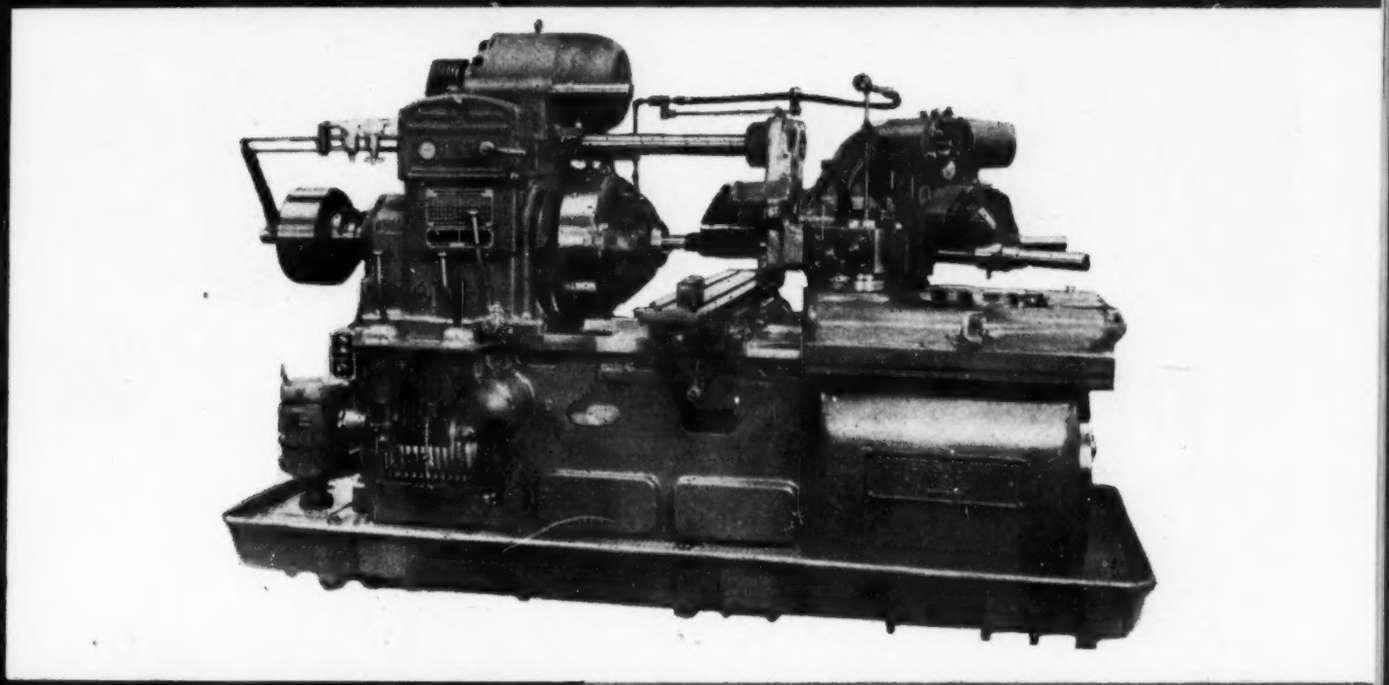
TEXROPE "Super 7" V-Belts result from the cooperative research of two great companies — Allis-Chalmers and B. F. Goodrich. They are sold only by A-C.

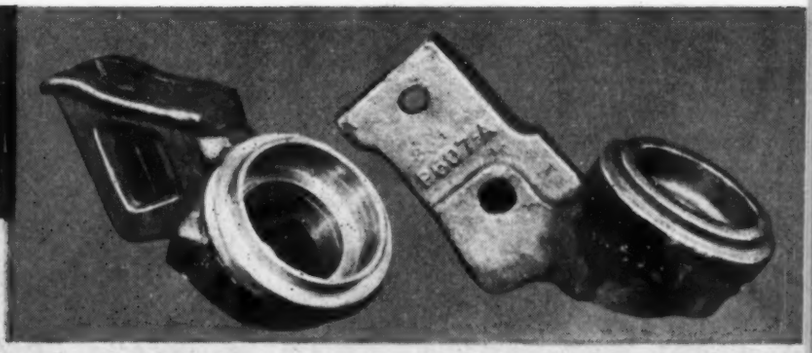
ALLIS·CHALMERS

One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products

1847 1947
A CENTURY OF SERVICE to Industry THAT MADE America Great

FLOOR-TO-FLOOR TIME REDUCED... *to a minimum in duplicate parts production on* ...a P&J 5 D AUTOMATIC





The large steel casting machined on this P & J Automatic is a bearing standard for heavy agricultural equipment. The 5 D was specially tooled to handle operations simply, quickly and accurately.

Number of pieces finished per hour and floor-to-floor time (figures available on request) are convincing proof of the outstanding performance and efficiency of this machine on duplicate parts production.

While the machine is set-up specifically for the job, re-tooling would be a comparatively simple matter in the event of job change because of the versatility in tool up inherent in all P & J Automatics.

Where production warrants, P & J can supply two spindle machines to handle work now being performed on single spindle units. Three sizes of two spindle machines are available.

The greatly increased production possibilities of double set up over single spindle are attained at practically no increase in floor space.

Ask P & J engineers to give you a time estimate on handling your work on P & J Automatics.

POTTER & JOHNSTON MACHINE CO.

Pawtucket, Rhode Island

DETAILS OF THE JOB

PROCEDURE:

Back angular face to be milled and drilled before coming to this operation; hold subject against angular plate with pusher bar on turret-position with pins in holes and grip on 3 chucking pads with 3 chuck jaws. (Compensating)

MACHINE AS FOLLOWS:

1st T.F.—Pusher bar for chucking purposes.

2nd T.F.—Tough bore 3.437" dia., bore and face 4.437" dia.; turn and face 4.791" dia.; turn 5.739 dia. to jaws; face 5.739" dia.

3rd T.F.—Machine groove in bore. (Slide Tool).

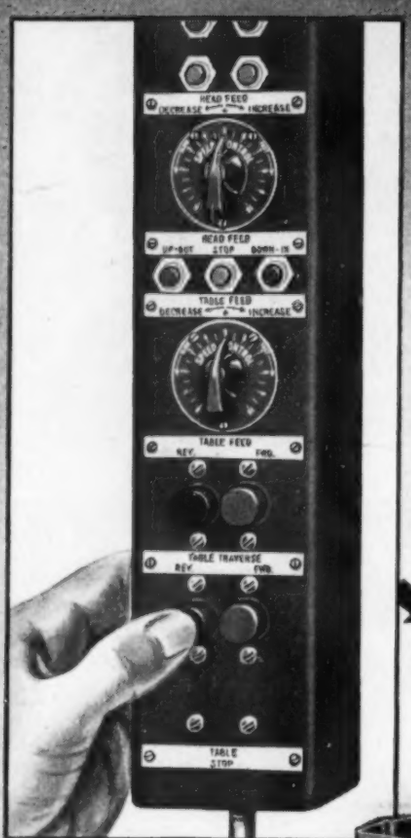
4th T.F.—Finish bore 3.437" dia.; bore and face 4.437" dia.; bevel edge of bore; turn and face 4.791"—5.739" dia.

5th T.F.—Ream or size bore 3.437"-4.437" dia; turn 4.791"-5.739" dia.

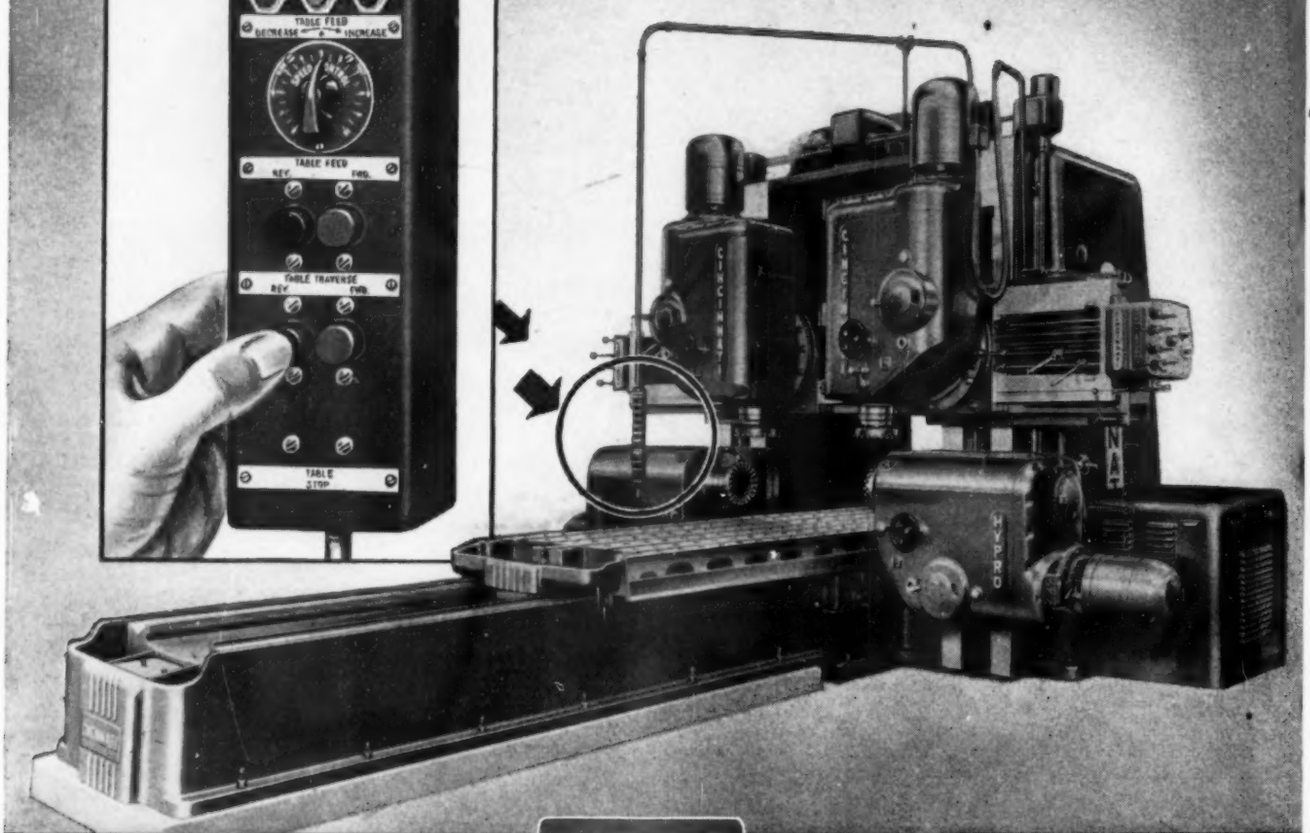
240 to 1 SPEED RATIO...

Hypro·electronic

PLANER MILLER DRIVE



240 to 1 speed ratio on all head and table feed rates. Completely adjustable from pendant station without gear changes.



THE CINCINNATI HYPRO PLANER COMPANY

PLANERS · BORING MILLS · PLANER TYPE MILLERS

CINCINNATI, OHIO

New rigidity and power for today's cutting materials

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LATHES
BORING MILLS
DRILL PRESSES
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BORING MACHINES
COLD SAW MACHINES
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER
SPECIAL MACHINES

NEWTON 8 SPINDLE TWO-STATION UNIT HEAD ROTARY MILLING MACHINE

Designed for high production milling of Automotive Cylinder Blocks and heads, transmission cases, and similar parts, this machine is equipped with two sets of roughing and two sets of finishing spindles with operating stations on each side of the machine, making possible twice the productive capacity of the conventional single station machine.

Send us your inquiries

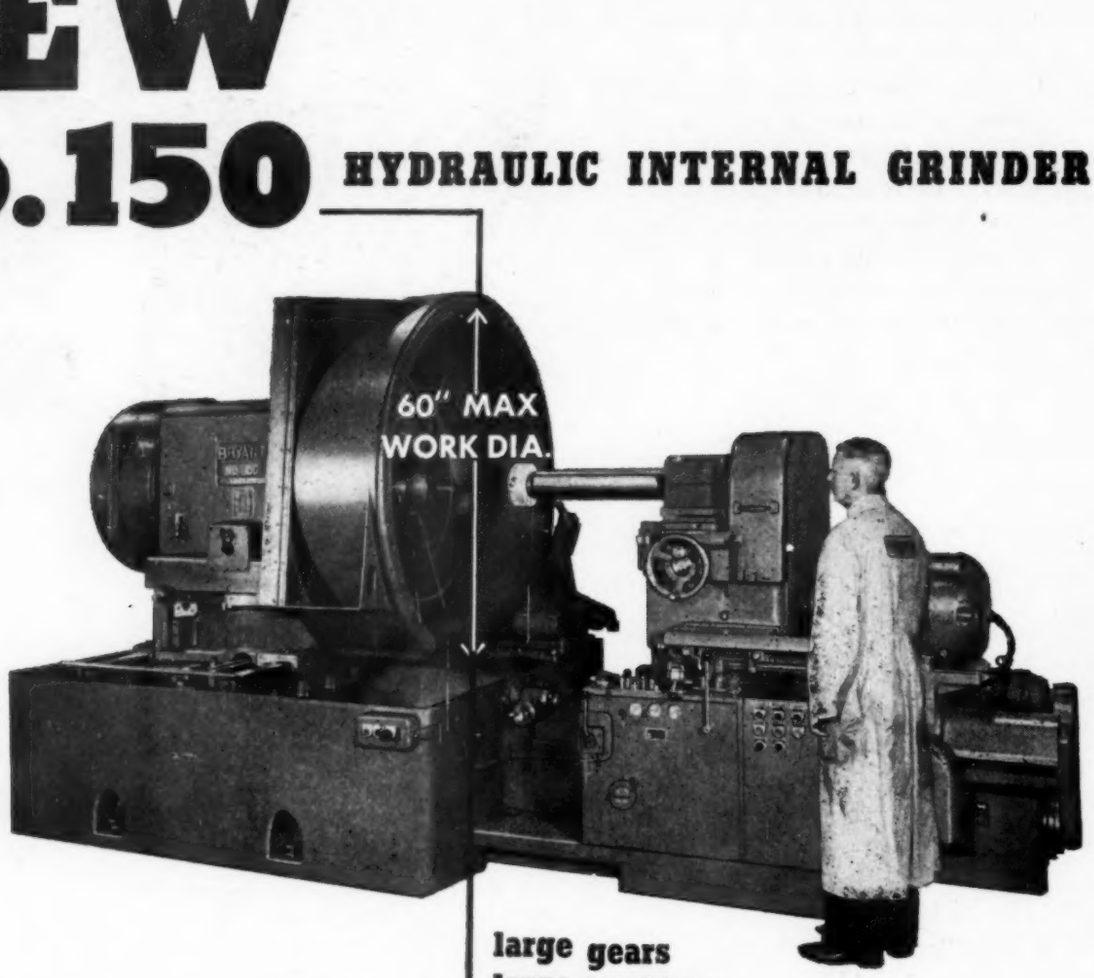
BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1861

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

NEW No. 150 HYDRAULIC INTERNAL GRINDER



large gears
large bushings
large bearings
large dies, etc.

Another Bryant Postwar Development for

The new No. 150 grinder is a great Bryant postwar achievement to vastly increase the internal grinding capacity of your plant. This big machine is easily controlled and produces the finest finish on gears, bushings, castings, etc., *up to 60" in diameter.* The many functional features of the new No. 150 assure extremely accurate work on a high production basis. The famous Bryant three point wheel slide suspension is basic and closely maintains wheel alignment at all times. A preloaded anti-friction cross-slide insures smooth hand and power cross feed, and a hydraulically retractable wheel slide simplifies the loading and unloading of parts. The work spindle is designed for the mounting of work fixtures on either end, and is hollow to facilitate the chucking of special spindles or long work.

In a single chucking, the new No. 150 can grind a bore, or a bore and face—the bore may be either straight or tapered. When grinding a face and straight bore the new No. 150 is particularly advantageous because it assures maintenance of squareness between bore and face. Outside diameters, or outside diameters and faces can also be finished in one chucking. A copy of the new catalog sheet giving full details is yours for the asking.

If you have internal grinding work in the range from 1/16 inch diameter bore to 60" diameter swing, Bryant has machines that will economically meet your requirements. It will pay you to—

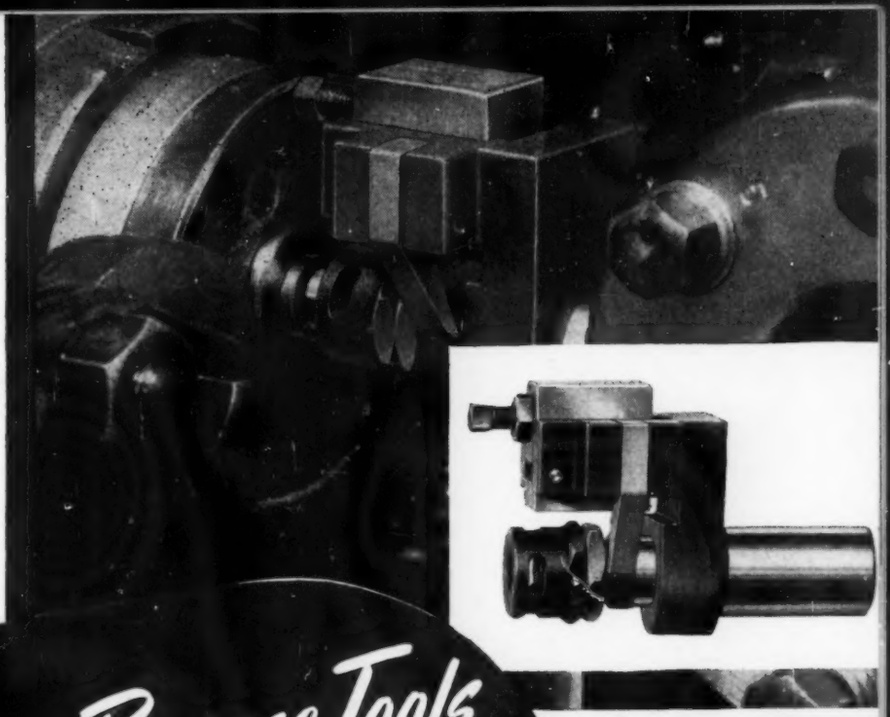
Send for the man from Bryant.

BRYANT

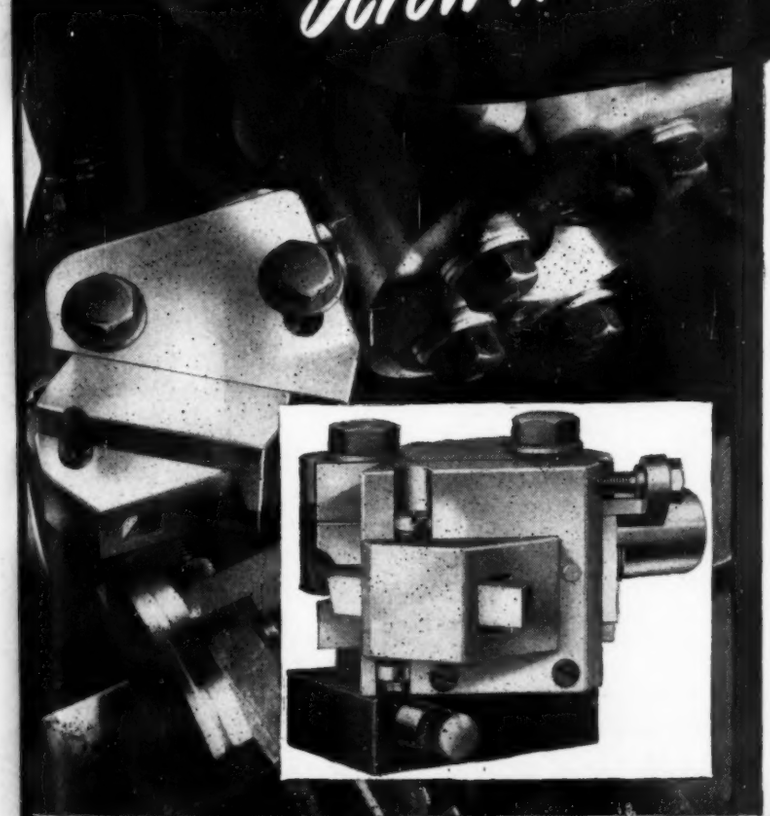
BRYANT CHUCKING GRINDER CO.
SPRINGFIELD, VERMONT, U. S. A.

FOR CUTTING FINE THREADS CLOSE TO A SHOULDER

Use No. 00GA RELEASING DIE HOLDER FOR "ACORN" DIES . . . a highly efficient tool designed for use where a small, fine pitch thread is to be cut and held to a definite length, as when threading close to a shoulder. An adjustable screw on the front of the holder governs the length of the thread automatically – independently of the reversal of the spindle. When the screw contacts the edge of the front box nut over the nose of the spindle, the forward movement of the die stops. Embodied in design of this tool are provisions that permit die to back off the work when spindle is reversed.



Two Special-Purpose Tools That Step-Up Screw Machine Production



FOR TURNING TAPER ON END OF WORK ADJACENT TO THE CHUCK

Use BROWN & SHARPE ANGULAR CUTTING-OFF TOOLS to turn a clean, sharp tapered point or cone with single point tool on work requiring pointing adjacent to the chuck. Tool severs the piece from the stock when cut is complete. These tools may also be used internally for chamfering. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

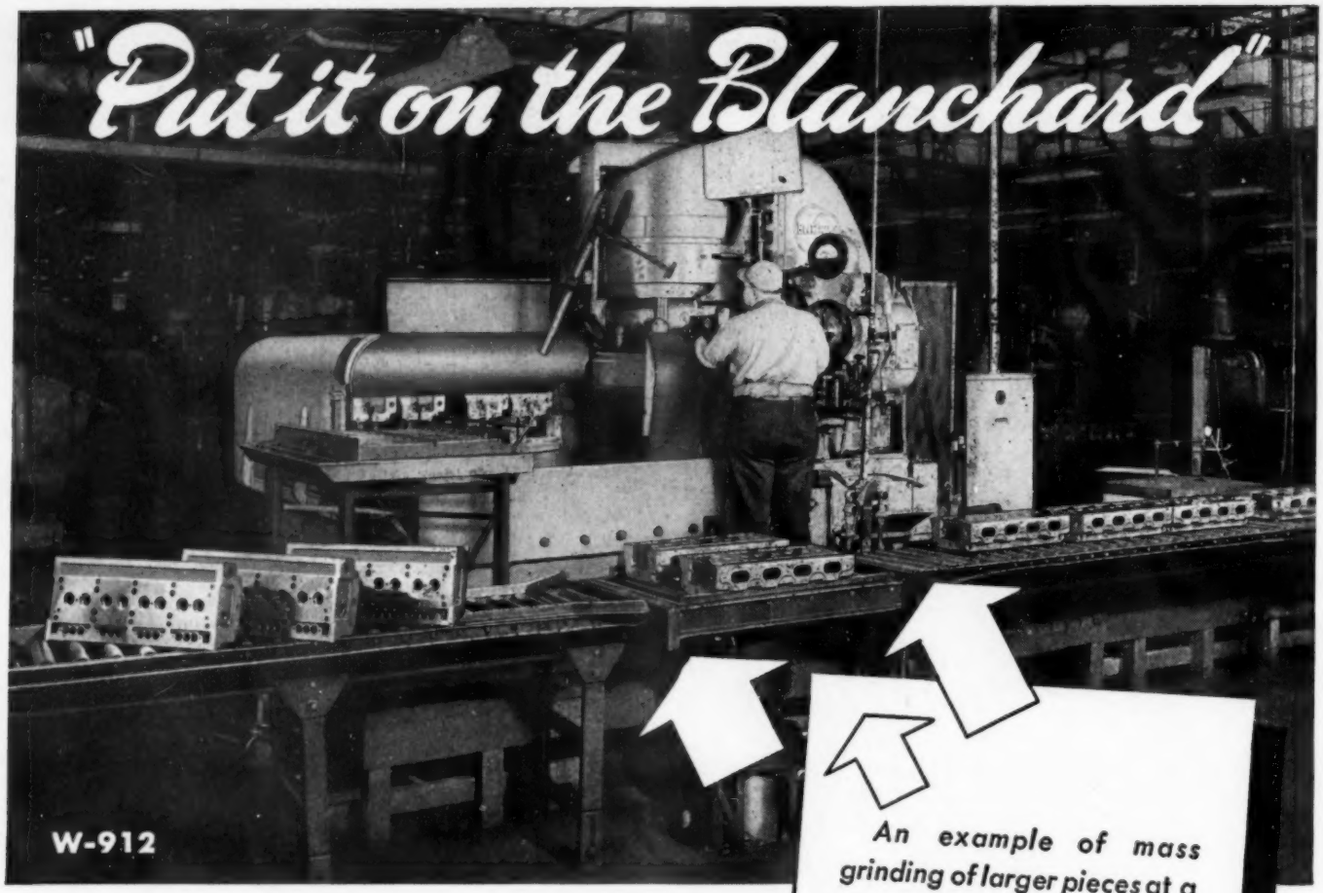
Whatever your screw machine operations, you can turn out better work — faster — with Brown & Sharpe Screw Machine Tools!

B·S

We urge buying through the Distributor

BROWN & SHARPE

"Put it on the Blanchard"



An example of mass grinding of larger pieces at a greater profit.

Four diesel cylinder heads are held on a 60" magnetic chuck of a No. 27 Blanchard Surface Grinder. The material is cast iron. Each head measures 25½" x 10¼" x 5 3/16".

Average stock removal per side is .005". One side is ground flat within .001".

Production is 27 pieces (27 surfaces) per hour. This includes loading and unloading time.

THE MOST PROFITABLE WORDS IN FLAT SURFACE GRINDING

Whatever type of flat surface grinding your parts may require—be it simple "cleaning up"—or rough grind *and* finish grind in *one* operation—or very flat surfaces with a fine finish and held to close limits—*there is no more profitable method,* in practically all cases, than to "Put it on the Blanchard."

Blanchard's specialization in grinding flat surfaces assures you the most profitable flat surface grinding machines you can buy.

IF YOU MACHINE FLAT SURFACES . . . bring your problems to The Blanchard Machine Company.

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

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What's a "Veeder-Reading" ...and how does it tell your future ?

"Veeder-Reading" is a standard term originated by one of the leading electrical manufacturers to designate the figures noted down, at stated intervals, from the face of a Veeder-Root Counting Device installed on a production machine or process.

And Every "Veeder-Reading" is a *Direct Reading* that tells the story without need of translation . . . tells in bold figures the exact number of turns, strokes, pieces, trips, motions or other performance-units completed by a machine during a minute, hour, shift or other production-period. So errors can be prevented, schedules tightened, production sped up, costs kept down. That's known throughout all industry as Veeder-Root *Count*rol. Find out how it can be built into *your* product, to brighten its sales future. *Write.*

The Counting House of Industry

VEEDER-ROOT INC.

Hartford 2, Connecticut

In Canada: Veeder-Root of Canada, Ltd., Montreal
In England: Veeder-Root Ltd., Dickinson Works, 20 Purley Way, Croydon, Surrey

Another SCHERR Time-Saver—

the new CHESTERMAN Height Gage

A BIG, STURDY, STABILIZED INSTRUMENT that will give you not only 1/1000" accuracy but also exceptional speed in height measurements.

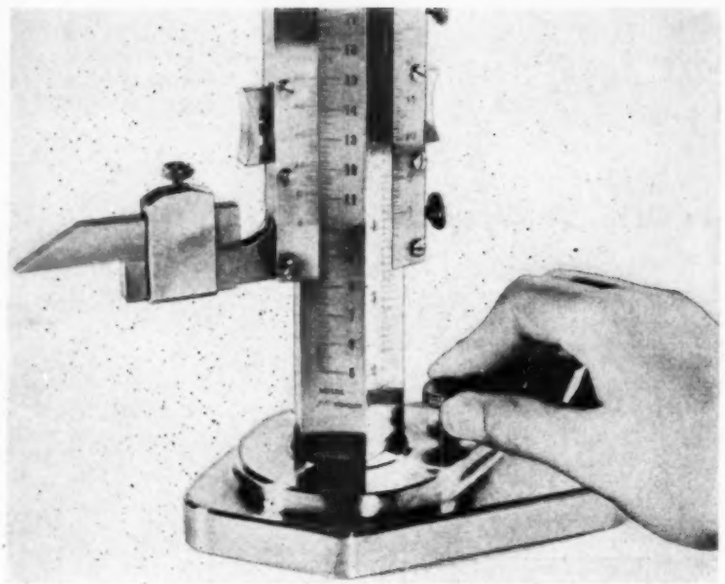
LARGE, QUICK-READING VERNIER is practically four times the length of vernier on conventional height gages—2.450" instead of the usual 5/8".

QUICK AND FINE ADJUSTMENT. Finger pressure on two lugs disengages the split nut from the micrometer screw, and the head can be slid quickly to a rough adjustment. Fine adjustment is then obtained by micrometer screw operated by the knurled nut in the base (see photo at right). The position of this nut is one of the big advantages of this gage, since unlike usual gage design its operation, even with a heavy hand, has no tendency to shift or rock the instrument.

BOTH ENGLISH AND METRIC READINGS. One on each face of the column, with vernier to match. English scale graduated to 1/20", reads with vernier to 1/1000". Metric scale in millimeters, reads with vernier to 1/50mm.

NO "BLOCKING UP" NECESSARY The Chesterman is made in 5 sizes: 12", 18", 24", 40" and 48". With capacities like these, even unusual height measurements can be taken without raising the base on blocks.

Deliveries NOW. Write for bulletin and full details.



Other SCHERR Production Aids

MAGNI-RAY magnifies and floodlights work under inspection.

COMPARITOL visual, magnified readings to tenths without dependence on "feel". Used widely in volume inspection.

Space in this ad does not permit listing all of our important money- and time-saving shop necessities, some of them familiar but many of them brand new. Study the small cuts here and send for detailed description.

ALL PURPOSE GRINDING FIXTURE quick, simple and accurate way to grind correct angles on cutting tools.

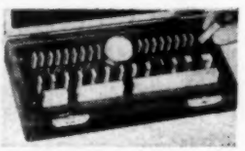
GAERTNER TOOLMAKERS MICROSCOPE magnified visual inspection of small part profiles. Enables direct and angular measurement.

MAGNE BLOX—greatly increase usefulness of magnetic chucks, holding work vertical or at an angle, etc.

TACHOMETERS—and revolution counters. Extremely accurate in measuring surface speeds as well as rpm.

PRECISION CALIPERS of stainless steel. Also height gages to 48".

GEAR TESTING FIXTURE for small gears. Runout shows on the dial gage. Center distance set by micrometer.

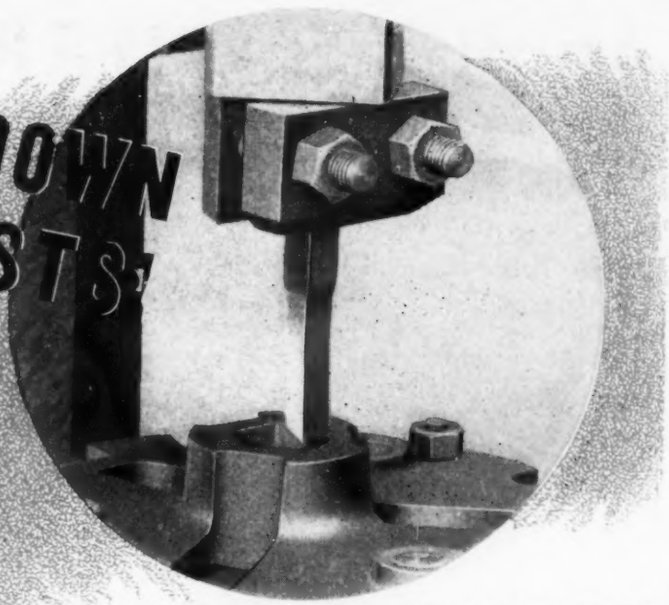


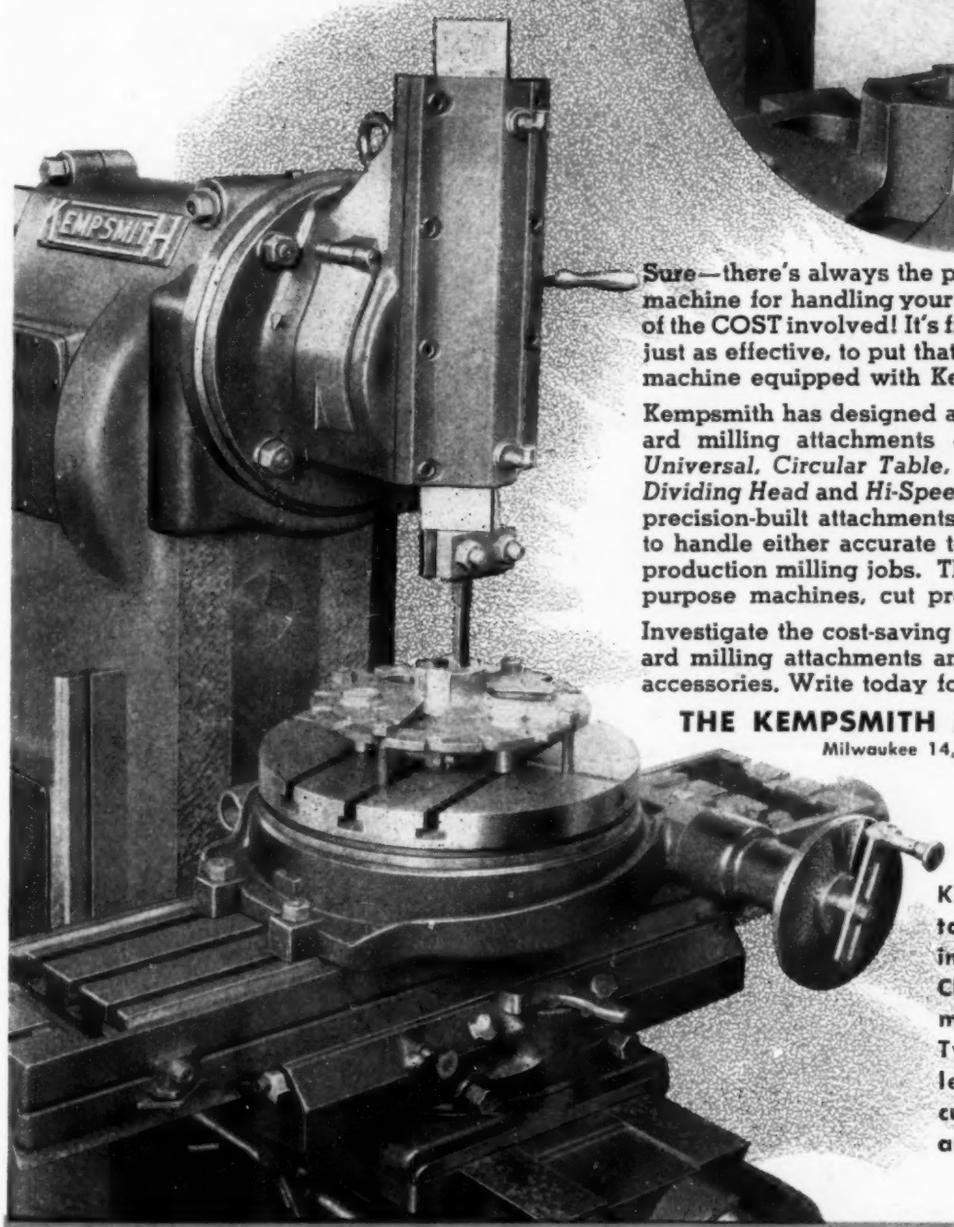
ULTRA-CHEX GAGE BLOCKS accurate to .000008". Large and small sets, for all needs.

EXPORT AGENTS—FOREIGN VISITORS—see our permanent exhibit of latest precision tools and equipment demonstrated under power. At our showrooms, address below.

GEO. SCHERR CO., Inc. 201 LAFAYETTE STREET NEW YORK 12, N. Y.

HOW TO SHAVE DOWN PRODUCTION COSTS





Sure—there's always the possibility of designing a special machine for handling your production milling job, but think of the COST involved! It's frequently more economical, and just as effective, to put that same job on a standard milling machine equipped with Kempsmith standard attachments.

Kempsmith has designed and perfected a variety of standard milling attachments — *Vertical Head, Heavy-Duty Universal, Circular Table, Slotter, Plain or Swivel Vises, Dividing Head* and *Hi-Speed Universal Attachments.* These precision-built attachments have long proven their ability to handle either accurate tool room operations or difficult production milling jobs. They eliminate expensive single-purpose machines, cut production costs to rock bottom.

Investigate the cost-saving advantages of Kempsmith standard milling attachments and complete line of arbors and accessories. Write today for literature.

THE KEMPSMITH MACHINE COMPANY
Milwaukee 14, Wisconsin, U. S. A.

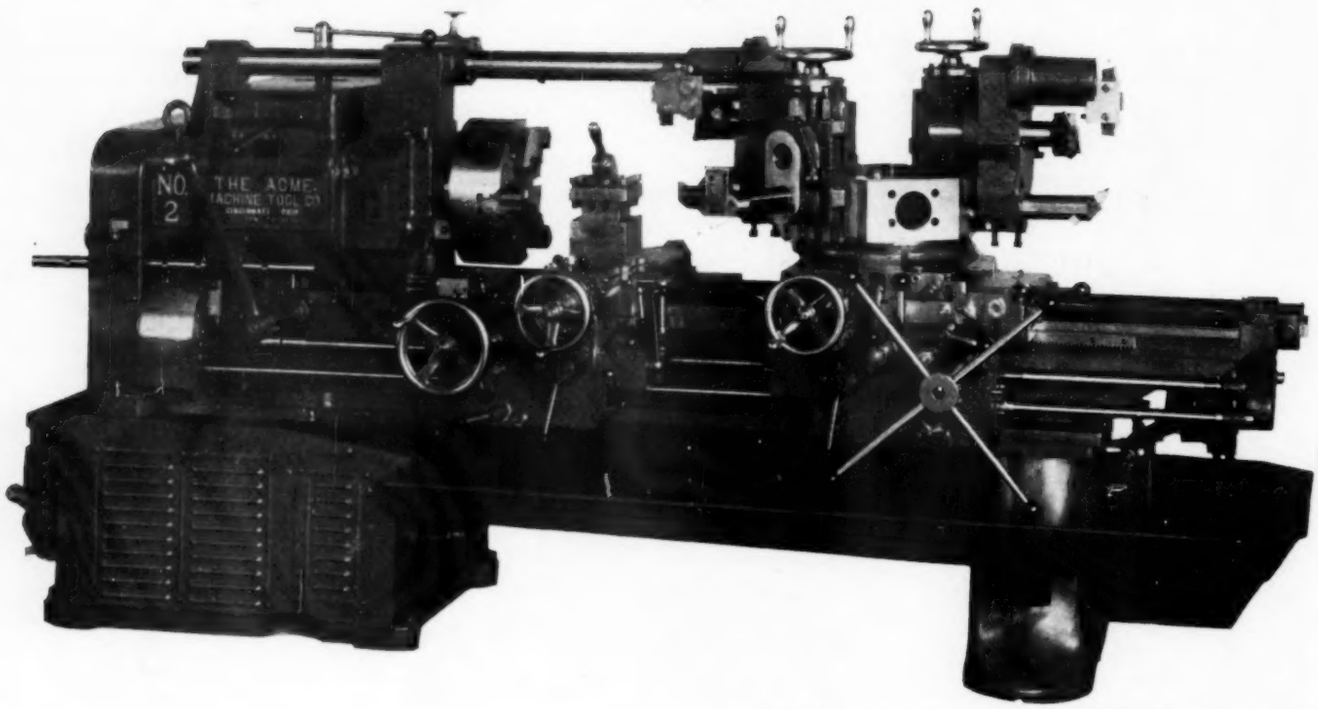
Kempsmith Slotting Attachment used for milling a hexagon bore in a Clutch Spider. The Attachment is mounted on a Type G Kempsmith Miller, equipped with Circular Milling Attachment and Indexing Mechanism.

KEMPSMITH

Precision Built Milling Machines Since 1888

A 4926-1PC

ACME TURRET LATHES ARE PRECISE SPEEDY POWERFUL



FROM bed to tool post all Acme Turret Lathes are built to provide the power, speed and precision necessary for modern requirements.

Acme engineers have also made another important contribution to the progress that is being made with cemented carbide cutting tools—they have developed a NEW LINE OF MASSIVE TOOL HEADS AND HOLDERS which assure maximum rigidity and range of performance.

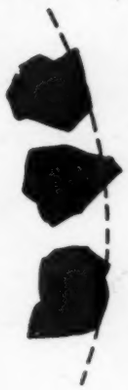
Available are adjustable multiple turning head which takes its support on a rigid heavy stationary bar mounted on headstock—five heavy tool holders of the straight and angular types—and a standard heavy duty multiple turning head with fixed center holes for holding the cutter heads.

In other words, every component part on an Acme Turret Lathe is designed to withstand anything you wish to machine with modern cutting tools.

The ACME MACHINE TOOL Co.
CINCINNATI 32, OHIO

Here's Why

32 ALUNDUM Grinding Wheels Are Showing Such Startling Results



When ordinary abrasives are crushed to size it results in many grains with flat sides. When such grains are bonded into a wheel it is often a flat side that is exposed in the surface instead of a useful cutting point.

No crushing to size is necessary, however, with 32 ALUNDUM abrasive. The grains form as individual crystals—pointed *on all sides.* No matter how they are bonded into a wheel one or more cutting points are exposed. And they are longer-lasting cutting points because they are over 99% pure fused alumina.

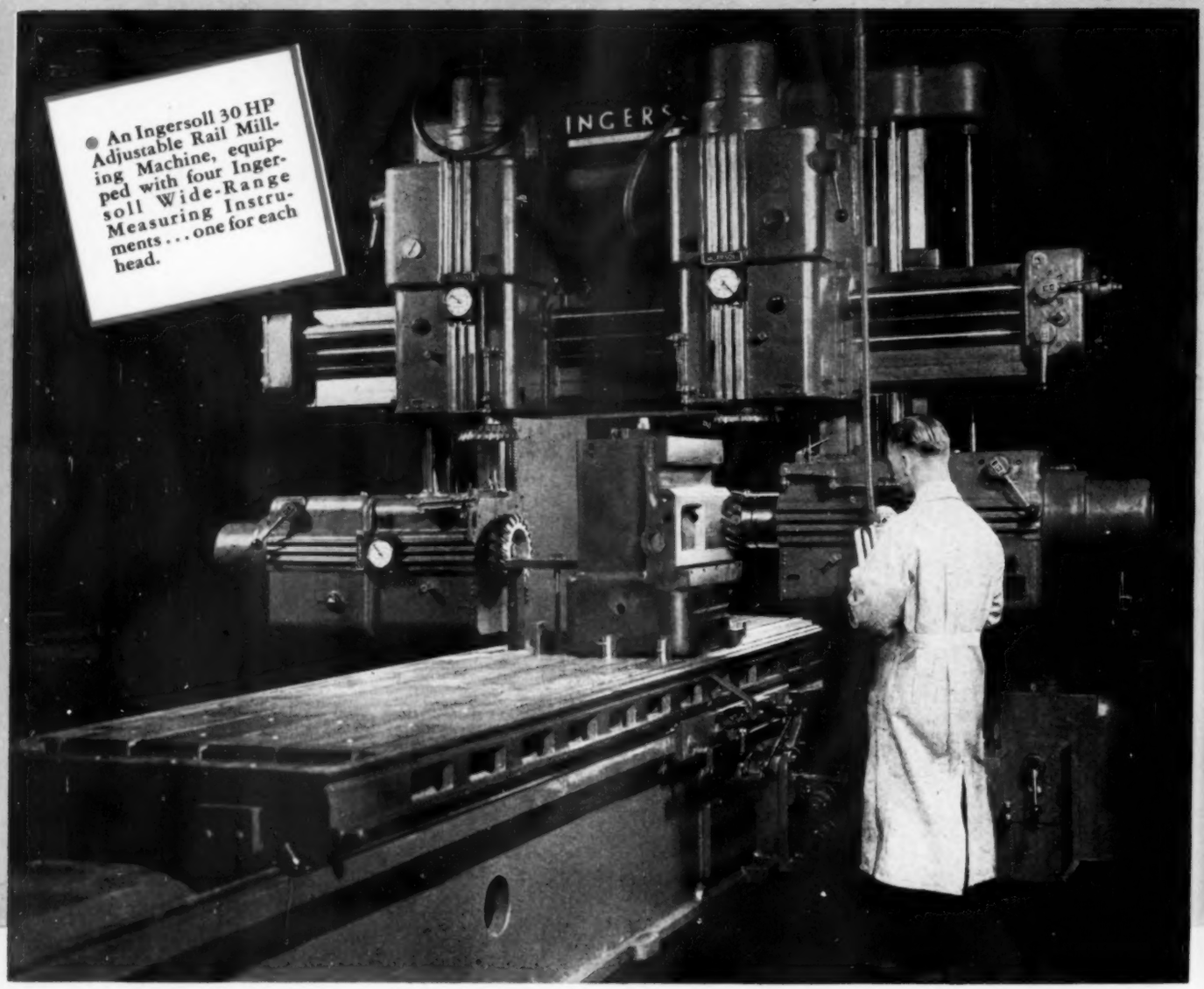
The greater number of longer-lasting cutting points doing the work means that a 32 ALUNDUM grinding wheel removes stock more rapidly. Because grinding heat is spread over more points, and points that stay sharp longer, "32" wheels cut cooler. Because there are more points doing the work and points that don't dull quickly, 32 ALUNDUM wheels require fewer dressings and last longer.

Ask your Norton abrasive engineer for Vectograph Demonstration

Norton Company, Worcester 6, Mass.

NORTON ABRASIVES

INGERSOLL MEASURING

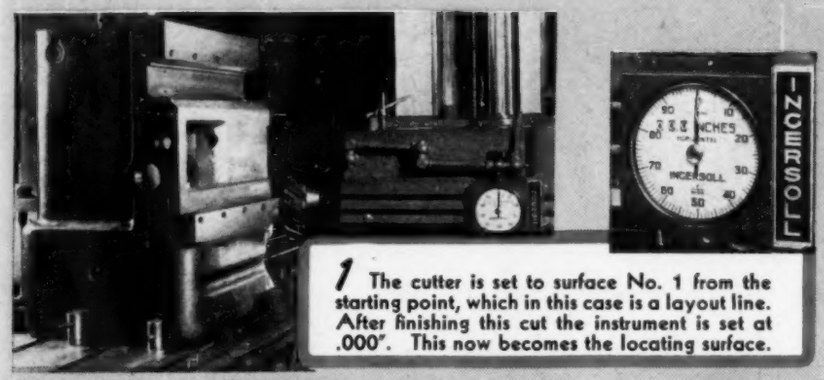

An Ingersoll 30 HP Adjustable Rail Milling Machine, equipped with four Ingersoll Wide-Range Measuring Instruments . . . one for each head.

● The Ingersoll Wide-Range Measuring Instrument is very effective in reducing "down time". The large dial mounted on the milling head, registers the in and out movement of the cutter spindle in thousandths of an inch. Cutter settings, which ordinarily would take as much as 5 minutes, may be made in but ¾ minute.

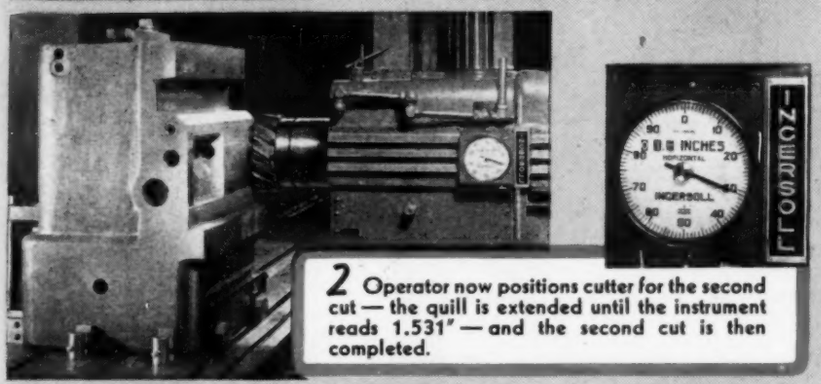
THE INGERSOLL MILLING

Wide-Range

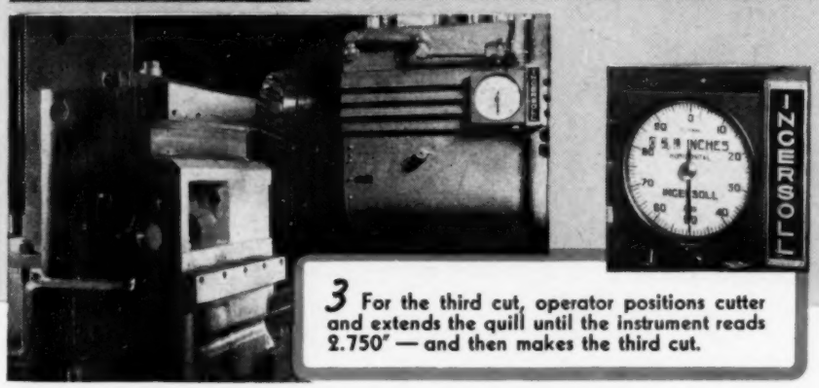
INSTRUMENT



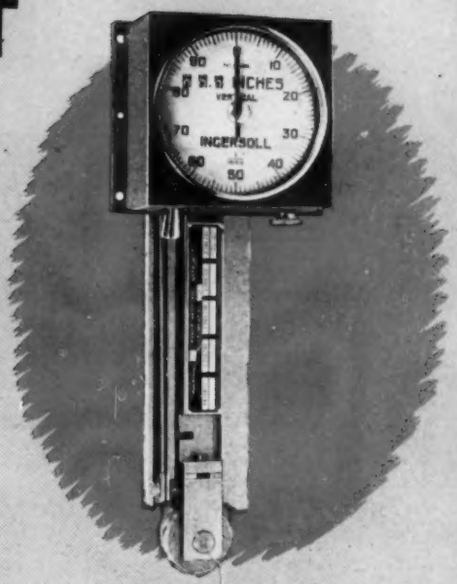
1 The cutter is set to surface No. 1 from the starting point, which in this case is a layout line. After finishing this cut the instrument is set at .000". This now becomes the locating surface.



2 Operator now positions cutter for the second cut — the quill is extended until the instrument reads 1.531" — and the second cut is then completed.

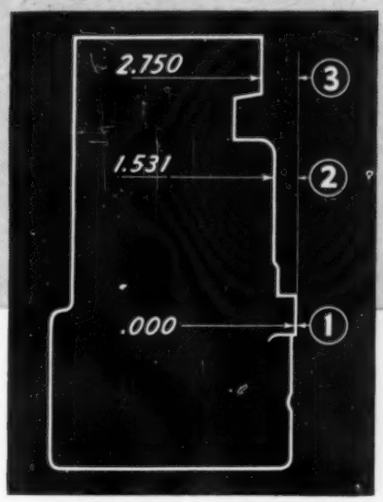


3 For the third cut, operator positions cutter and extends the quill until the instrument reads 2.750" — and then makes the third cut.



● This is a self contained unit, accurate to plus or minus .001" over its entire range. The dial is large and clearly visible from the operator's position.

● The above illustration shows how to accurately set a cutter from one milling surface to another without the use of scales or "Jo-blocks". For all ordinary work the operator depends completely on the instrument and no other checks are required.



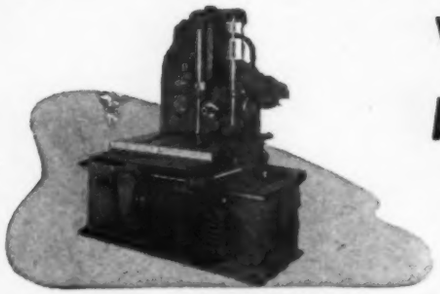
● The above print is of the casting shown on the machine table opposite. There are three surfaces to be milled, all made with the same cutter, but requiring three different cutter settings.

MACHINE CO., ROCKFORD, ILLINOIS

Retract and Reposition Your Work

within .0002" Selected Location

by Push Button Controls!



3-B DEVLIEG JIGMIL Provides for

Minimum Tool Overhang

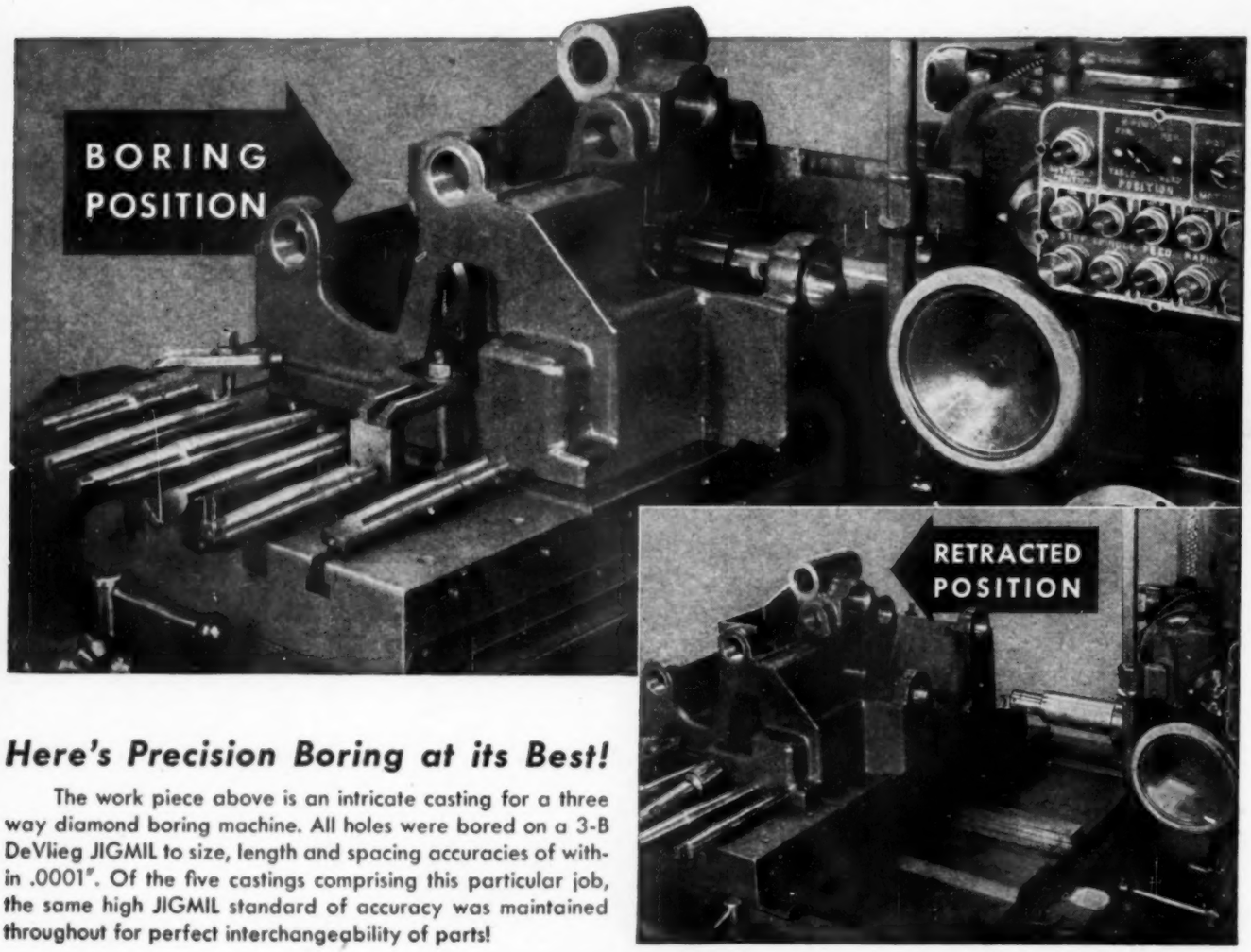
Maximum Operating Efficiency

Greater *Controlled* Accuracy

You can save time, cut costs and reach new high standards of accuracy on your difficult precision jig boring and milling operations with a 3-B DeVlieg JIGMIL.

Location of work for minimum tool overhang and top performance advantage! Ready accessibility for necessary tool adjustments and changes! Convenience for checking machined dimensions! All these are served by JIGMIL's centralized push button control means which unlocks and retracts the table to open position, then automatically repositions and locks the table to within .0002" of the selected position.

In addition, JIGMIL's push button controls provide automatic hole spacing accuracy within .0001". Write today for complete descriptive and technical literature.



Here's Precision Boring at its Best!

The work piece above is an intricate casting for a three way diamond boring machine. All holes were bored on a 3-B DeVlieg JIGMIL to size, length and spacing accuracies of within .0001". Of the five castings comprising this particular job, the same high JIGMIL standard of accuracy was maintained throughout for perfect interchangeability of parts!

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

IF ALL YOUR ALUMINUM CASTINGS AREN'T *Blue Ribbon Babies*

The Alcoa Service Engineer can make suggestions and recommendations that will help you cut down rejects, and get more ready-to-ship castings out of your aluminum ingot inventory.

He may suggest minor pattern changes or a different Alcoa Casting Alloy. Or a change in the spotting of gates and risers. Perhaps your melting procedure or foundry techniques can be improved. Aluminum foundry procedure is his business; his advice can help you make your Alcoa Pig and Ingot go further, with fewer rejects and casting repairs.

If you need information or technical help on aluminum casting practices, write to ALUMINUM COMPANY OF AMERICA, 2107 Gulf Bldg., Pittsburgh 19, Penna. Or call the Alcoa sales office nearest you.

MORE people want MORE aluminum for MORE uses than ever

ALCOA FIRST IN **ALUMINUM**

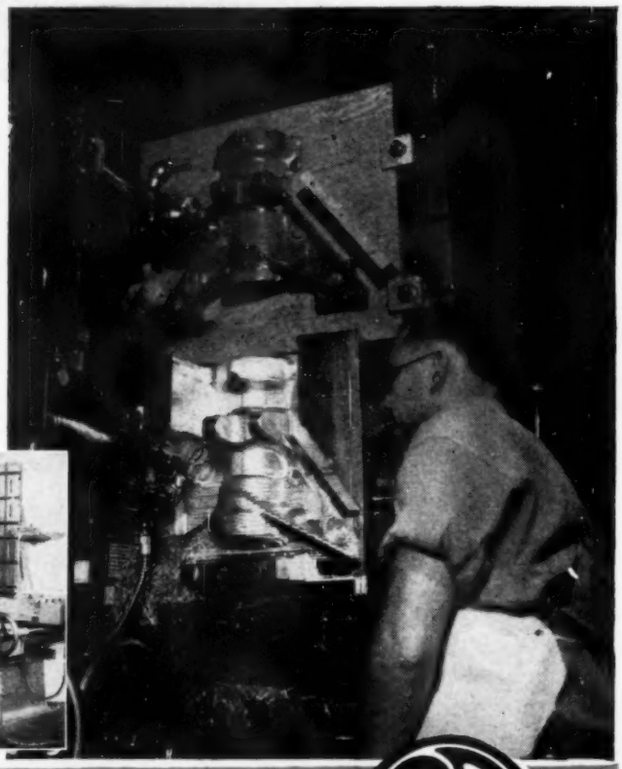
IN EVERY COMMERCIAL FORM

THE NOUN THAT BECAME A VERB

"Let's *KELLER* it, Tom... Tracer-controlled milling will save time and money ...give us a better job, too!"

KELLER is the *name* of the Pratt & Whitney Tracer-controlled Milling Machine... a machine that produces dies, mold cavities and many other tools quickly, accurately and at low cost. Hence KELLER is a *noun*.

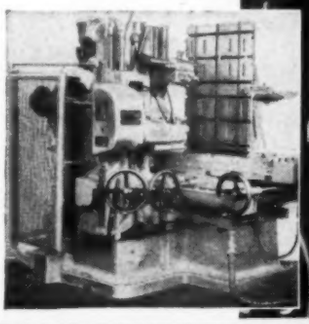
But, through the years, an unusual development has occurred. The noun has acquired a dual personality. It has been made a *verb* — by industry itself. "Let's Keller it," tool engineers say. "Keller that forging die and we'll lower the costs," remarks the die shop foreman. "Kellering will give us the exact mold duplication we require," asserts the plastics manufacturer.



What *action* does the verb "Keller" denote? Accurate profiling in two dimensions . . . faithful reproduction in relief in three dimensions . . . of complicated forms, dies and punches, die-casting dies, molds for plastic materials, cams, many other metal tools, and even experimental work and pilot models. Master forms may be of metal, wood, cement, one of the artificial stones or pattern materials . . . simple or complex in design.

What is the *result?* Work so accurate that frequently little or no hand finishing is needed. Savings in machine time *and* hand finishing time make a Keller Machine a *paying* investment.

"Kellering" reduces tooling costs, cuts experimental costs. There are Keller Machines to meet the full range of your requirements. Write for complete information.



PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1 • CONNECTICUT

CLE-FORGE SPECIAL PURPOSE DRILLS

TRADE MARK REG. U.S. PAT. OFF.

ARE *Engineered* FOR THE JOB

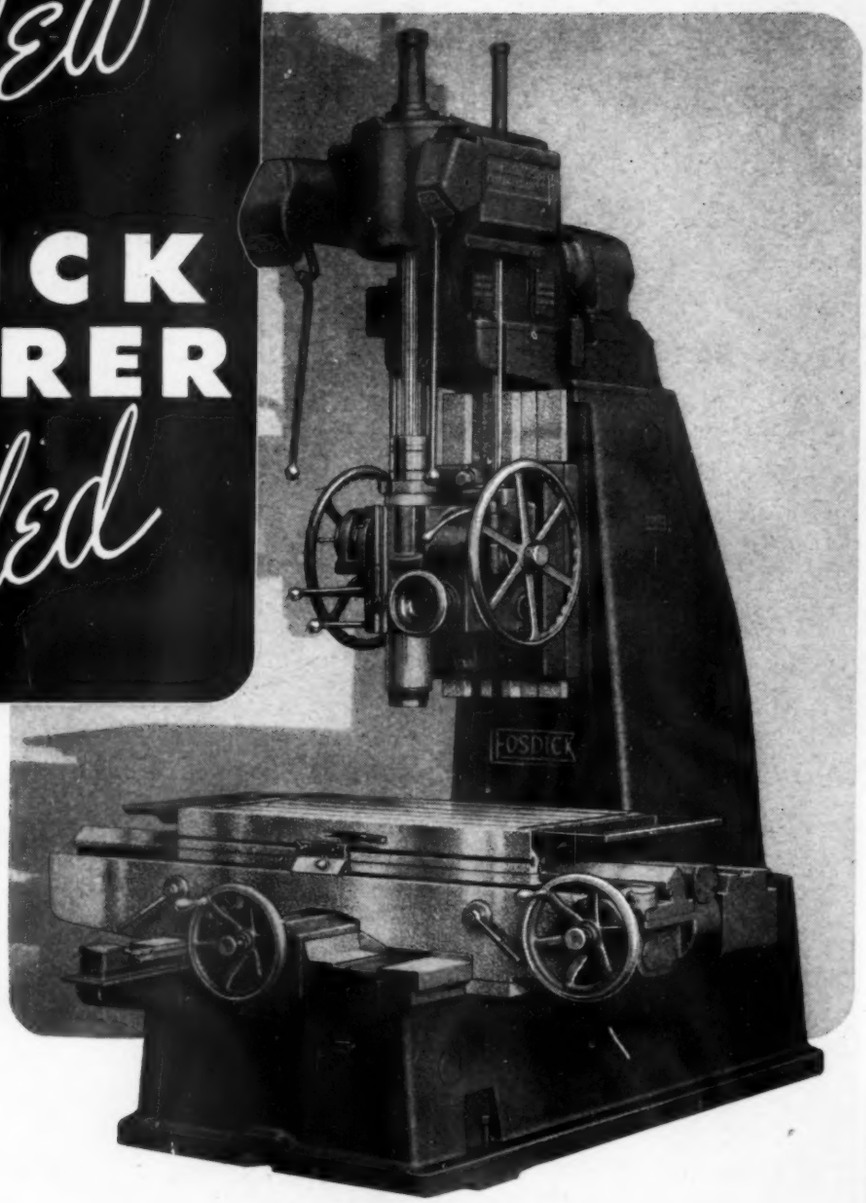
Proper selection of drills will enable you to produce better work *faster* and at lower cost. Special jobs call for Special Purpose Drills which have been developed to meet certain specific requirements. ◈ One example is found in the photo below showing a set-up of 148 Burner Drills. Their short flutes and sturdy construction make them ideally suited to overcome the difficulties of drilling castings of this kind. ◈ Send for your copy of new, illustrated booklet describing these and other Special Purpose Drills.

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49TH STREET
CLEVELAND 14

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

29 THOMAS ST., NEW YORK 7 • 9 NORTH JEFFERSON ST., CHICAGO 6 • 459 HOWARD ST., SAN FRANCISCO 5
2929 EAST GRAND BLVD., DETROIT 2 • 1902 NORTH FIELD ST., DALLAS 1
E. P. BARRUS, LTD., LONDON W.1, ENGLAND

A New FOSDICK JIG BORER is Added



● Fosdick is meeting the demand for a heavy duty machine with one specifically developed to handle large heavy work. However, it is also adaptable to lighter, small work.

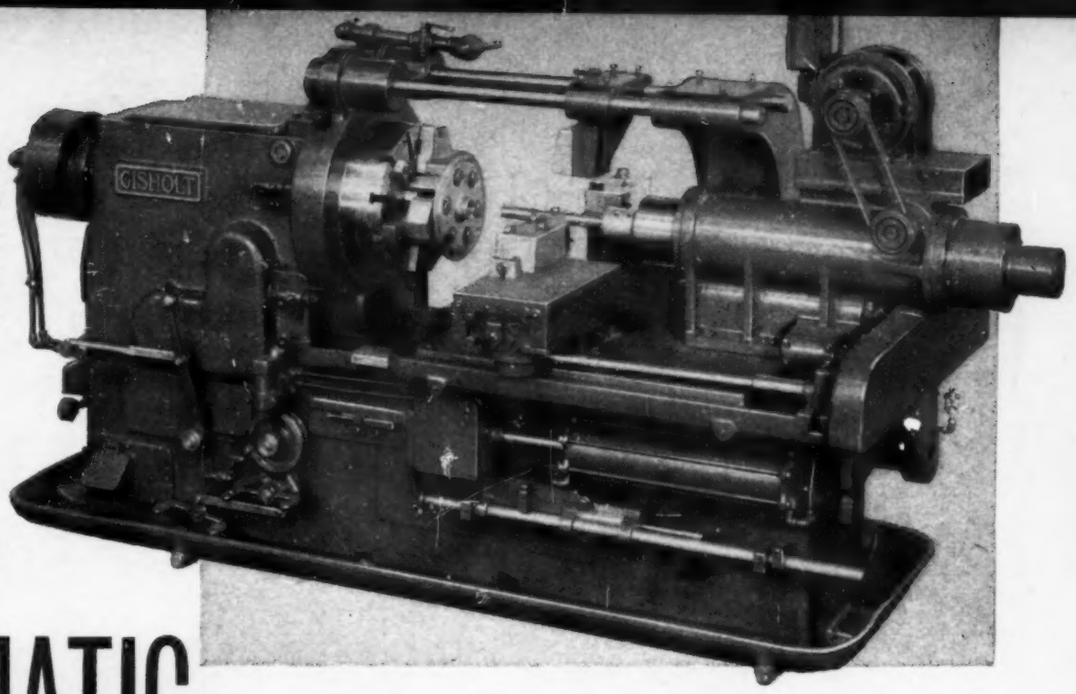
All controls and operating handles are at the front of the machine—a feature which substantially reduces operator's handling time—and is an exclusive Fosdick feature on all Jig Borers.

Simplicity of operation permits average drill press operator to turn out accurate work on jigs, fixtures and miscellaneous production parts—easily—quickly—at low cost.

Rapid power traverse in both directions, and all the other outstanding Fosdick features which simplify operation and speed up production are included in the new Jig Borer.

Detailed descriptions, functioning diagrams, specifications, and highlights of construction are contained in the Fosdick Jig Borer Bulletin J. B. A. *Write for yours today.*

THE Fosdick MACHINE TOOL COMPANY
CINCINNATI 23, OHIO



standard platen type Simplimatic, specially tooled for machining rear le drive gear hubs, in combination ith standard tool slides, is equipped ith motor-driven quill for rotating the boring bar. Part is completely chined with 7 rough and finish cuts in 2½ minutes, floor to floor.

THE GISHOLT

SIMPLIMATIC *makes it* SIMPLE — *and* FAST!

• Here's another example of the adaptability of the Gisholt Simplimatic—a standard machine which gives you all the advantages of an automatic lathe individualized for the specific job.

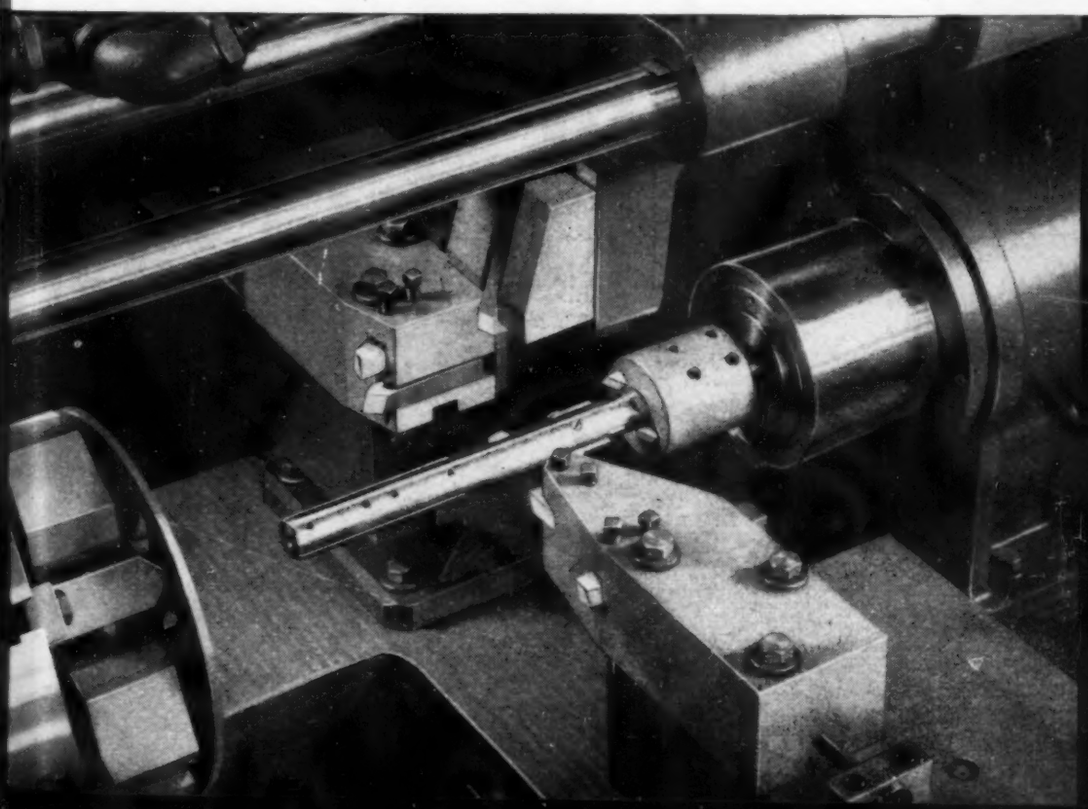
This is made possible by the large horizontal platen table which permits a greater number of independent tool slides, each favorably cammed for its own particular cut, and providing an ideal condition for each tool as to cutting speed and feed, order of engagement, dwell and retract.

Rugged, fast, and accurate, the Simplimatic pays dividends in any shop, small or large, seeking maximum production at minimum cost. Ask for complete information.

GISHOLT MACHINE COMPANY
1201 East Washington Avenue • Madison 3, Wisconsin

Look Ahead . . . Keep Ahead . . .
with Gisholt

GISHOLT



TURRET LATHES
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AUTOMATIC LATHES
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SUPERFINISHERS
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BALANCERS
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SPECIAL MACHINES

The ADAMS COMPANY
DUBUQUE, IOWA
ESTABLISHED 1883

Van Keuren MEASURING WIRES

STANDARD EQUIPMENT *Everywhere*

Measuring the pitch diameter of a 1"—8 National Form thread gage with three wires. This method is recommended by the Bureau of Standards.

Van Keuren Measuring Wires are the accepted standard equipment for making pitch diameter measurements of taps, thread gages, precision threaded parts, worms, splines and gears.

Reputable manufacturers of the ground taps and thread gages used for the production and acceptance of threaded holes and nuts use Van Keuren Measuring Wires. You will seldom find them in error if you, too, have Van Keuren Measuring Wires.

Set No. 20 Thread Measuring Wires is a plant necessity for maintaining taps and thread gages within their limits for wear and for proving the pitch diameter of screws and threaded male parts.
Price, High Speed Steel Wires $ 95.00
Price, Carboloy Wires $240.00
Special wires from .002" to 1.510" diameter—prices on application.

Set No. 20 Thread Measuring Wires.

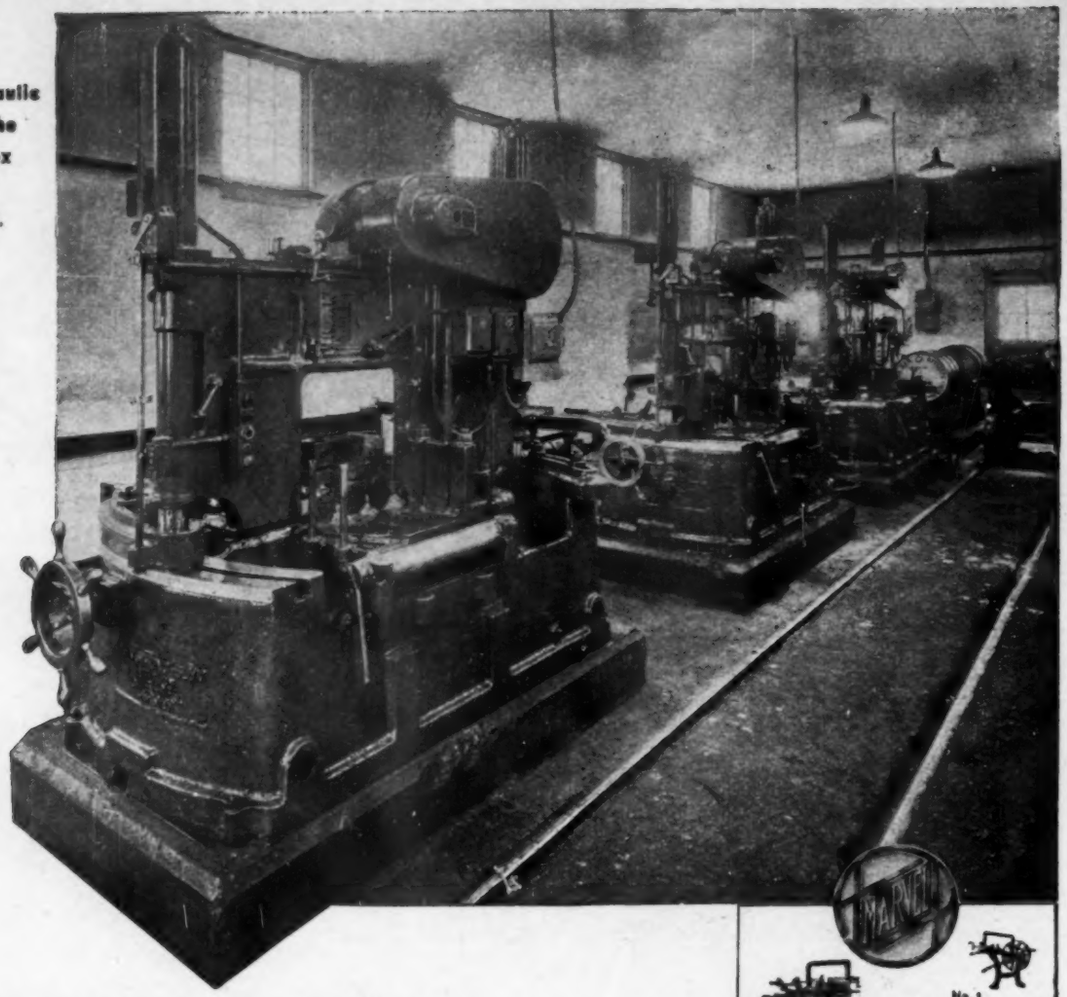
It is easy to use Van Keuren wires. The Van Keuren handbook, "Precision Measuring Tools," gives complete tables and simplified formulas for measuring standard and special threads, splines, gears and worms. Send for this valuable 160-page handbook No. 33

THE Van Keuren CO., 176 WALTHAM STREET, WATERTOWN, MASS.

27th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires.

3 MARVEL #18 Hydraulic Hack Saws at the Babcock & Wilcox Tube Co.— Beaver Falls, Pa.



EASILY CUT-OFF TOUGHEST STEELS

Steels just don't come too tough for MARVEL Giant Hydraulic Hack Saws. Take, for example, the three No. 18 MARVEL Saws, at the Babcock & Wilcox steel mill, shown above. These machines are used to cut test specimens from sample pieces of stainless and other tough alloy billets which are checked for seams, pipes, etc., before being drawn into tubing. It takes tough steel to make the best tubing, and it takes modern sawing equipment to cut it rapidly, accurately and economically.

With 10 types of metal-cutting saws, each available in a series of variations, MARVEL can furnish sawing machines that exactly meet your requirements. If you have a metal-sawing problem—call in the local MARVEL Sawing Engineer.

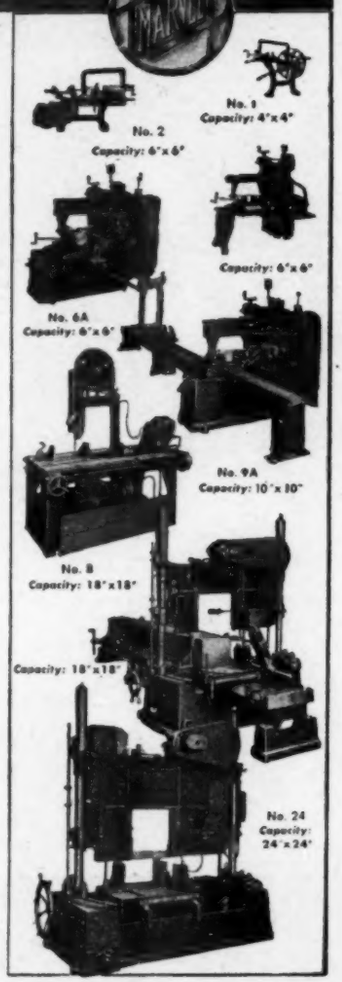
Write for MARVEL Catalog or check it in your Sweet's Catalog Files

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 BLOOMINGDALE AVENUE CHICAGO 39, U. S. A.

Eastern Sales Office: 225 LAFAYETTE ST., NEW YORK 12, N. Y.



MARVEL SAWS

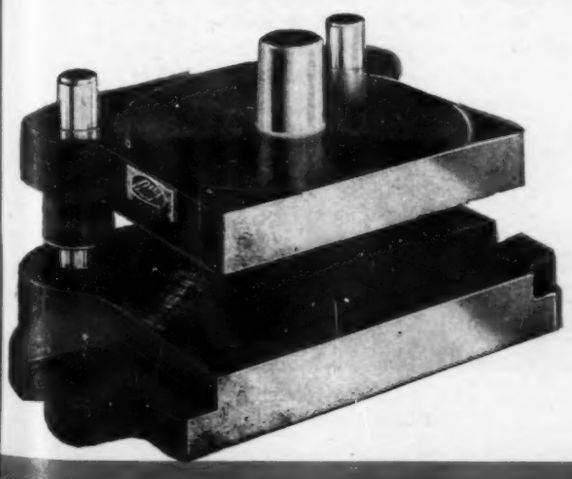
EFFICIENT SELF SERVICE

is a matter of Press Production

Modern merchandising owes much of its efficiency to a modern production method—*Press Production*. The Press is ideally suited to the production of panels for self-service refrigerators display counters, shelving—the many duplicated parts in the mechanism of a tabulating cash register.

In the press departments and Stamping Plants of America, Danly Die Sets and Die Makers' Supplies are recognized as a necessary part of good presswork, because Danly means *known dependable accuracy*.

DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue • Chicago 50, Illinois



DANLY
National Assembly

Call Danly

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- **DETROIT 16**
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  16 Commercial Street
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- **DUCOMMUN METALS & SUPPLY CO.**
  4890 South Alameda, Los Angeles

DIE MAKERS' SUPPLIES

DANLY DIE SETS

Welded Steel Fabrication

IT'S THE KNURLING THAT COUNTS

UNBRAKO

Reg. U. S. Pat. Off.

"Unbrako" Self-Locking Socket Set Screw with the KNURLED point

It's the knurled point of the "Unbrako" Socket Set Screw that digs in and holds tight—regardless of the most chattering vibration. Yet, it can be backed-out and used over and over again. There are millions of these dependable "Unbrako" Self-locking Socket Set Screws with the knurled cup point in use in industry. **"Unbrako" and "Hallowell" products are sold entirely through distributors.**

Pat'd & Pats. Pend.

Knurling of Socket Screws originated with "Unbrako" in 1934.

You can't screw socket screws in or out, without a hex socket wrench — so why not get our #25 or #50 "Hallowell" Hollow Handle Key Kit which contains most all hex bits. Kits: Pats. Pend.

"Unbrako" Knurled Socket Head Cap Screw

The "Unbrako" Knurled Socket Head Cap Screw has the knurling around the head—right where it gives even the most oily fingers a real slip and fumble-proof grip. This knurling makes it possible to screw the "Unbrako" Head Cap Screw in farther and faster before a wrench is used—a real time and money saver where production is all important. The "Unbrako" Catalog contains complete information about the many types of Screw Products carrying the famous "Unbrako" name—get your copy and keep it handy.

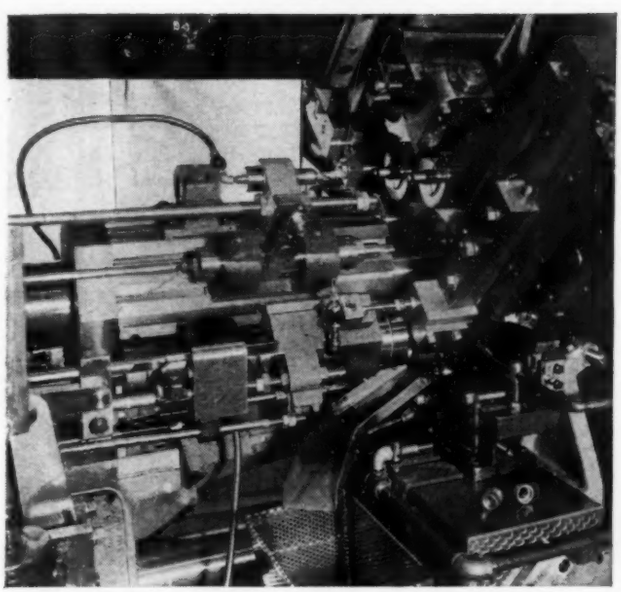
OVER 43 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX 4 · BRANCHES: BOSTON · CHICAGO · DETROIT · INDIANAPOLIS · ST. LOUIS · SAN FRANCISCO

Time saved... Cost Reduced

...on a tough job!



Not only do Acme-Gridley Bar and Chucking Automatics save money by producing more, but they are easier to set up, or to change from one job to another. Tooling area is large, visible and accessible. They are *versatile* machines.

Look this one over—it's not as easy as it seems.

Bicycle sleeve clutch, $1\frac{1}{8}''$ diameter, made from SAE 5115 bar stock. Fifteen separate operations required. 34 equally spaced ratchet teeth, including pick-off and counterbore back end.

On an Acme-Gridley 6 Spindle Bar Automatic, the machine time per part is 13.7 seconds—262 completed parts per hour.

Here is a suggestion for production men:

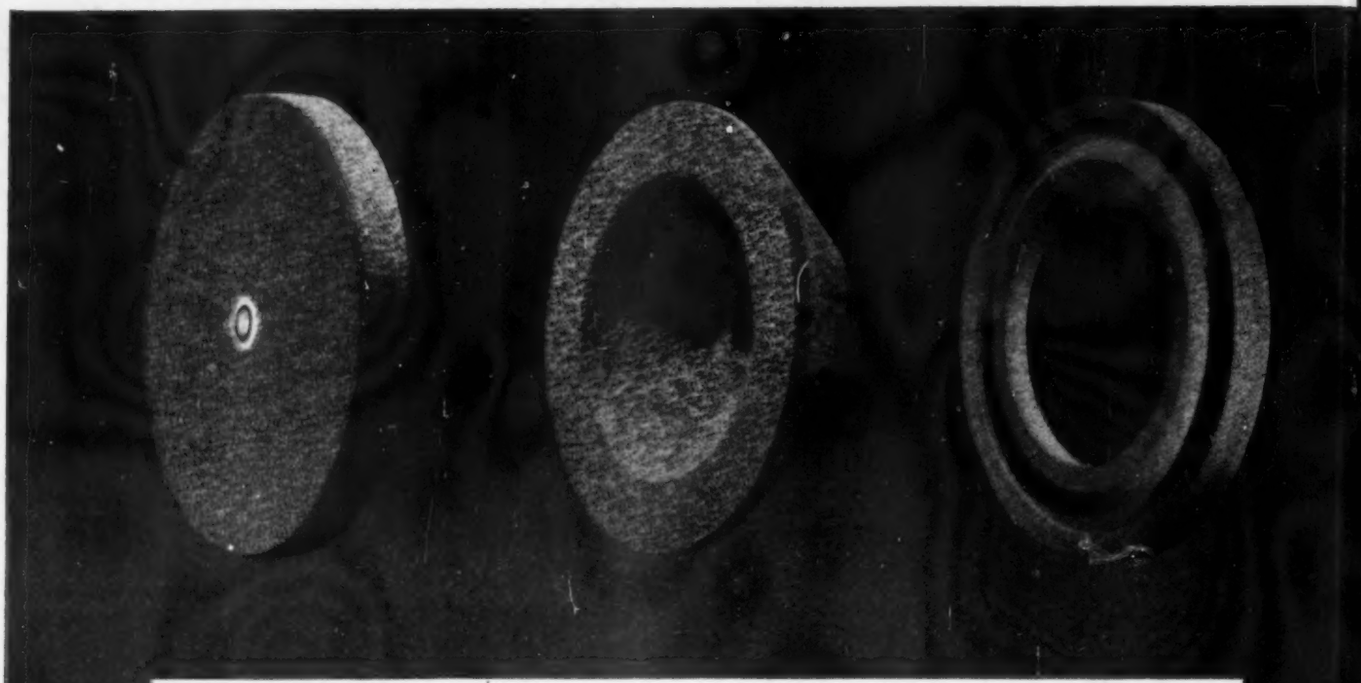
Figure your own machine time on any long-run job—from actual records or from your cost estimates. Then send us blueprints and get an Acme-Gridley time estimate on the same job.

That's a good way for you to find out where costs can be reduced in your plant, on parts you are producing today.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing



Got time to think about grinding?

Is your grinding so perfect there's no chance for improvement?

Would you be willing to say your grinding costs could not be reduced?

Best way to find the answers is by taking time for a complete analysis of your grinding operations. Top production speed and low costs come only when you use the correct wheels and machines for your particular work.

Call in Peninsular engineers, specialists in this field for 58 years. They will completely study your machines, your grinding methods, the metals you grind. From their findings, they will develop grinding wheels that get the results you want.

Peninsular job-designed wheels can save money for you. *Every* Peninsular grinding wheel is specially made for its particular job.

The Peninsular Grinding Wheel Co., 729 Meldrum Ave., Detroit 7. *Sales Offices:* Chicago, Philadelphia, Boston, Buffalo, Cleveland, Newark, Pittsburgh, Houston, St. Louis, Cincinnati.

PENINSULAR

INDIVIDUALLY PENINSULAR *ENGINEERED*

GRINDING WHEELS

SINCE 1889

SPECIALISTS IN RESINOID BONDED WHEELS

The big Peninsular clock has a rim and hands made of a special disc wheel for shoulder grinding, numerals made of portable wheels, and a cup-wheel center.

ARMSTRONG

Drop Forged
EYE BOLTS

They'll carry the load

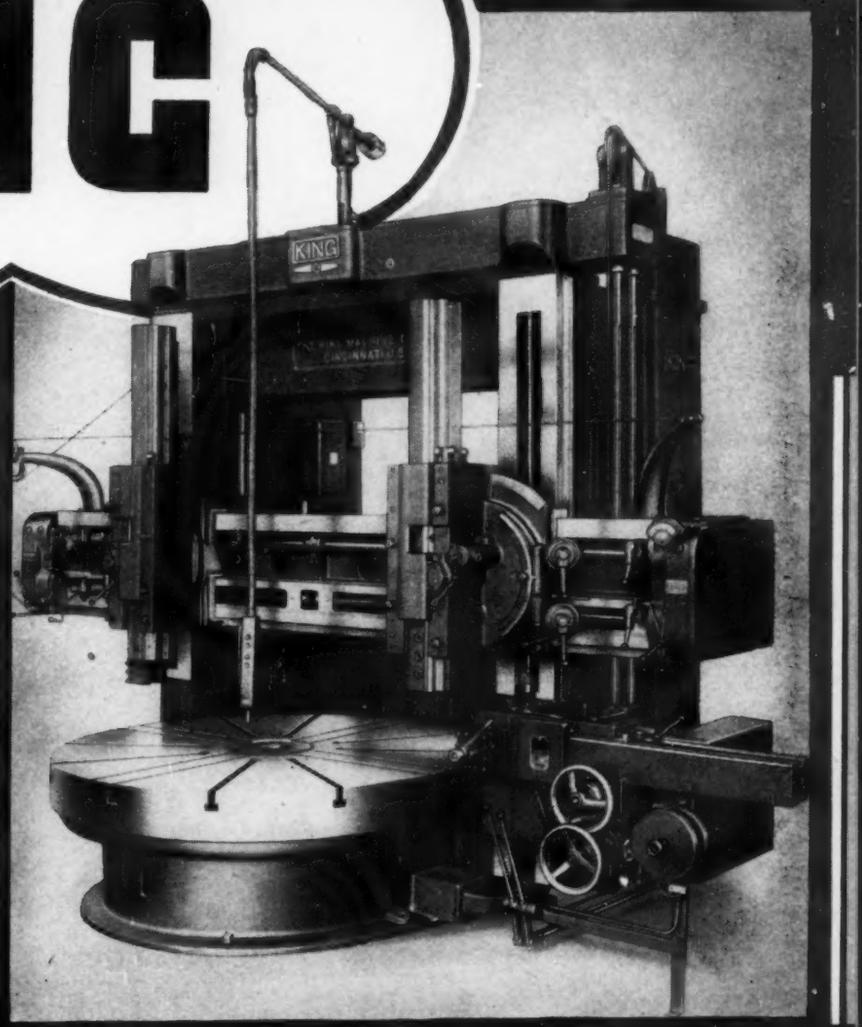
Specify ARMSTRONG Drop Forged EYE BOLTS for extra strength — correctly engineered proportions, forged-in quality, uniformity of design in all sizes, and the best mild steel, heat treated to increase tensile strength.

ARMSTRONG Drop Forged EYE BOLTS as built to tool standards, are not hammered out in "tonnage forgings". They come in plain or shoulder patterns, blank or threaded, in 14 sizes, shank diameter from ¼" to 1½", inside diameter of eye ¾" to 2½". They will always carry their rated load safely.

Write for Catalog

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
315 N. Francisco Ave. **Chicago 12, U. S. A.**
Eastern Whse. and Sales: 199 Lafayette St., New York 12, N. Y. Pacific Coast Whse. and Sales Office: 1275 Mission St., San Francisco 3, Calif.

New Series KING



VERTICAL BORING AND TURNING MACHINES *for* POWER—SPEED AND RIGIDITY TO HANDLE CARBIDE TOOLS

● If you are one of the numerous manufacturers who is contemplating reductions in cost to meet new competitive situations—you will be interested in this new series King Vertical Boring & Turning Machine.

First—because it has the power, speed, and rigidity required for the successful use of carbide tools.

Second—because all operating controls are at the front within easy reach of the operator from his normal working position.

Third—because they have range of speeds—high or low—to meet every operating requirement. As long as the desired range is within sound engineering standards, King will furnish the range to meet your needs.

If you are looking for a machine capable of the heaviest cuts at highest speeds which modern cutting tools will stand—then investigate the new series King.

Available in ten sizes—30", 36", 42", 52", 62", 72", 84", 100", 120" and 144".

THE KING MACHINE TOOL COMPANY
CINCINNATI 29, OHIO
Builders of Vertical Boring and Turning Machines Exclusively

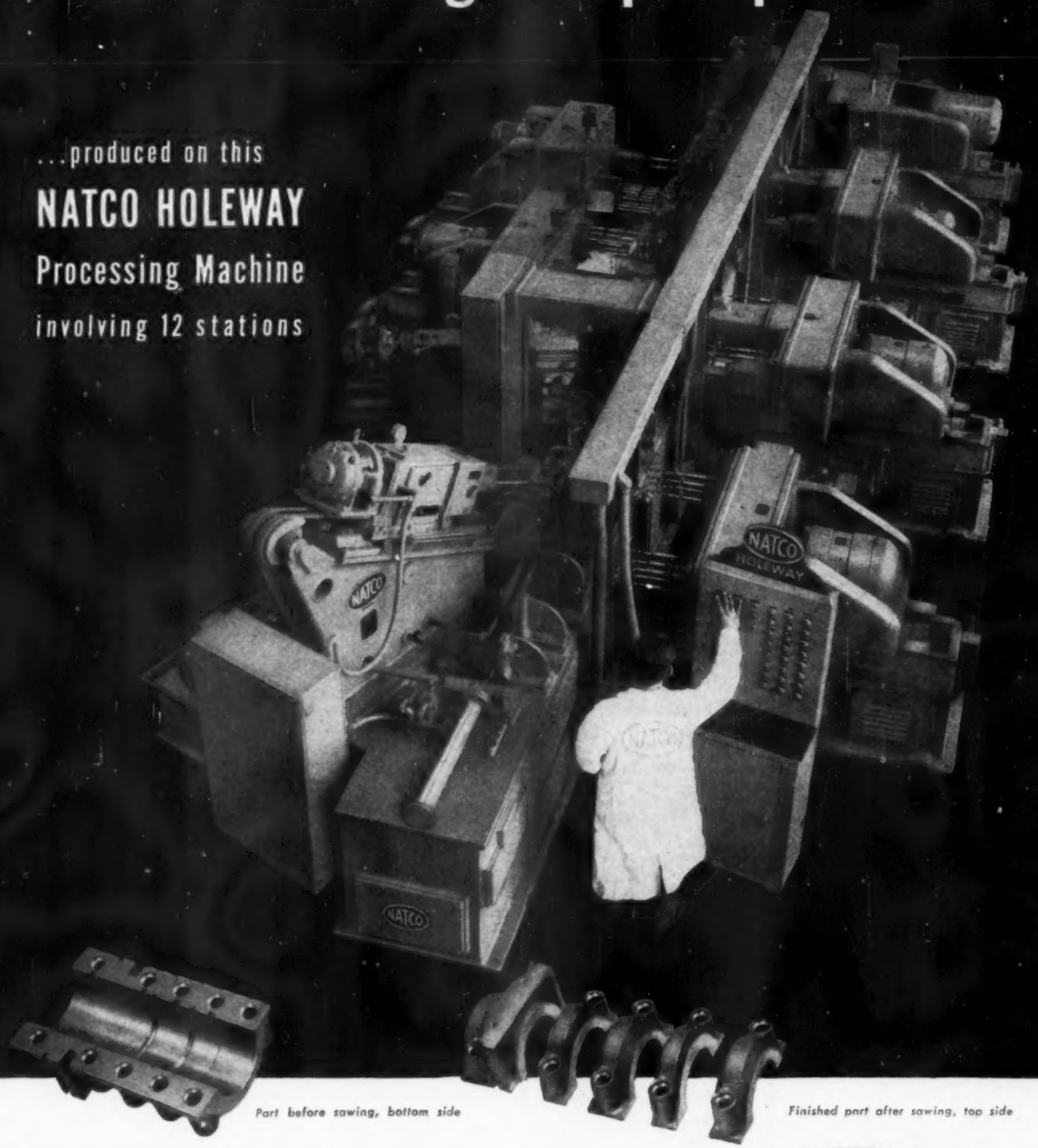
475 Bearing Caps per Hour

...produced on this

NATCO HOLEWAY

Processing Machine

involving 12 stations



Part before sawing, bottom side

Finished part after sawing, top side

One man on this NATCO HOLEWAY Processing Machine produces 95 of these bearing cap sets (475 individual bearing caps) per hour

• In keeping with the trend to automatic handling — less operator fatigue and more production per man — NATCO provides this processing type machine arranged to complete the following operations between loading position # 1 and unloading position #12: drills 20 holes; mill chamfers both sides of center bearing; drills 2 angular holes; combination drills and countersink 2 holes; chamfer 10 holes; taps two holes; countersinks 10 holes; spotfaces 10 holes; mills 5 bearing liner lock notches; saws finished bearing casting into five component parts as shown above—and unloads automatically.

NATCO

Write today for NATCO Machine Circular 145-A

NATIONAL AUTOMATIC TOOL COMPANY, INC., RICHMOND, INDIANA, U.S.A. • *Branch Offices:* **1809 Engineering Building, Chicago • 409 New Center Building, Detroit • 1807 Elmwood Avenue, Buffalo • 2902 Commerce Building, New York City**

We certainly don't expect you to join our growing list of customers *unless* we can give you better abrasive products for *your particular production jobs* . . . plus better service.

Our rapid growth in ten years from one of the smallest makers of abrasive products to one of the largest, didn't just happen. Company after company found we could help them get better production, lower costs . . . and give them better service. That's how we built our business.

Should you use MID-WEST abrasives? The only way we know for finding out is for you to give us a trial. It's worth it . . . if you're looking for better production, lower costs, and better service. Call us. We'll cooperate.

James Jackson
PRESIDENT

MID-WEST ABRASIVE COMPANY

OWOSSO, MICH. DETROIT ROCHESTER, PA.

GRINDING WHEELS HONING STONES COATED ABRASIVES

LOCK JAW *Stops*

SLIDING

HEAVING

SHIMMYING

CHATTERING

YAWING

BUCKLING

HANDY *New All-Purpose* CLAMP

Eliminates expensive clamping and bolting operations. No more hunting around the shop for straps, bolts, washers, nuts or scrap pieces to wedge or lock your work in position. No oddly and awkwardly contrived, odd-sized and makeshift locks, limited in their ability to wedge and hold.

Now LOCKJAW gives you positive, powerful two-way locking, sure grip pressure downwards and side-ways. It may be set at any angle on the table and held by the T-slot bolt. Then LOCK-JAW pressure is applied to one or more pieces of stock by simply adjusting Capstan Jack Screw.

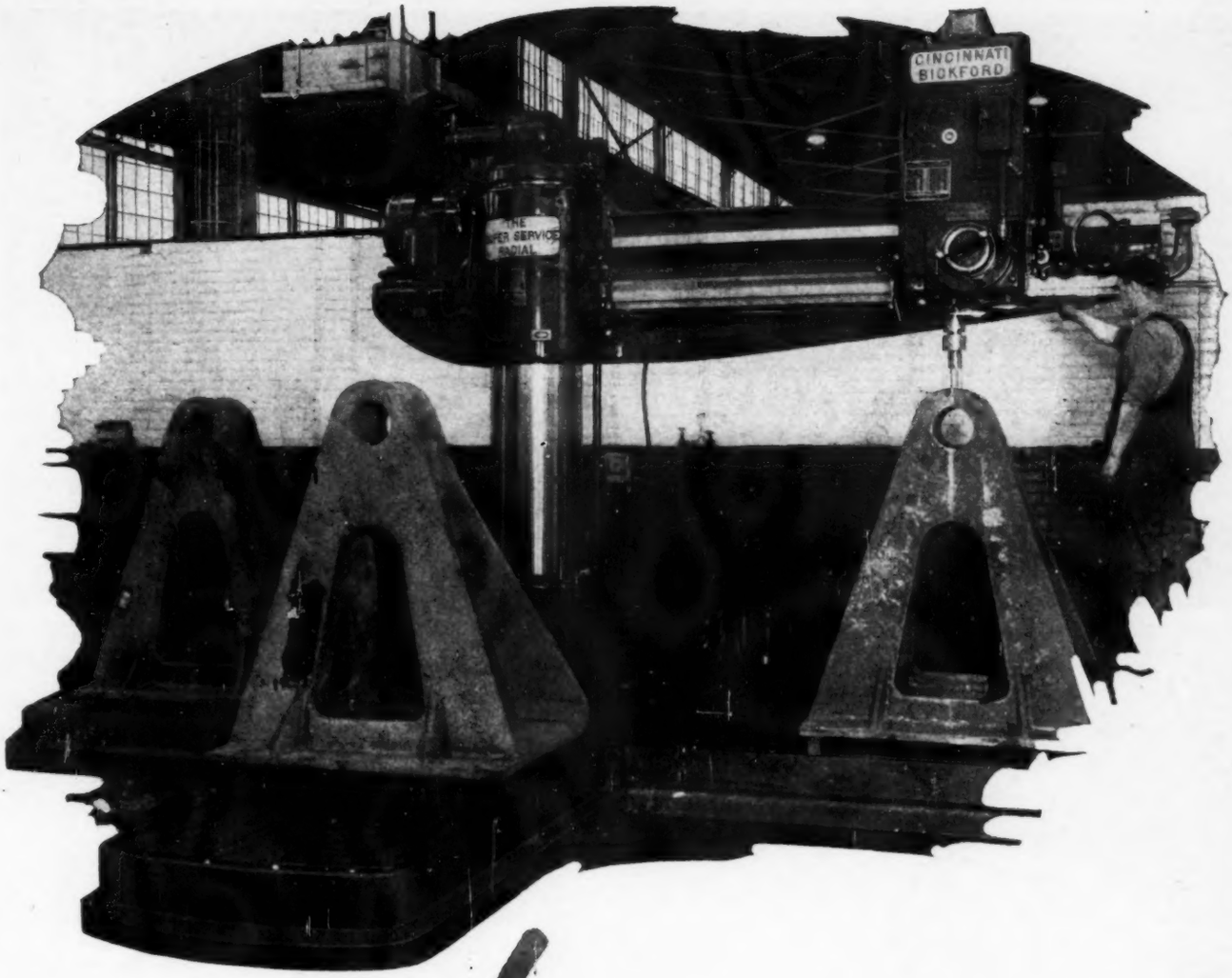
Setting up or taking down is a quick and simple operation. Every machine shop, tool room, or metal working unit can find many handy uses for this new Rivett conceived clamp on their planers, radial drills, shapers, milling machines, surface grinders and boring mills.

You, too, will save time, trouble and inconvenience when you use LOCKJAW to eliminate cumbersome and awkward clamping.

RIVETT

RIVETT LATHE & GRINDER, Inc.

BRIGHTON • BOSTON • MASS. • U. S. A.



Handy

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Equal Efficiency of Every Unit
Makes the Balanced Machine

The triple-end base on this Cincinnati Bickford Super Service Radial Drill is saving time in handling these 3200-lb. castings and, in addition, the controls centralized on the head follow the job and save the operator much time and effort.

With this set-up, The Budd Company, Philadelphia, Pa., is saving 20% of the time previously required to drill and tap these 3-inch holes.

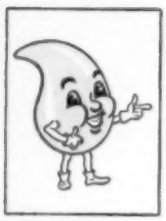
Fast handling, accurate work and ease of performance are always productive and profitable.

Write for detailed Bulletin R-24A.

• • •

See our condensed catalog in Sweet's File.

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9. Ohio U.S.A.



It is a fact that certain Shell *greases* for high-speed bearings are more fluid than heavy grades of lubricating *oil* . . . and that other Shell greases are solid "block" lubricants that are sliced up in bricks to be placed in the journals of heavy machinery.

It is also a fact that fluidity is just one of the factors a Shell Lubrication Engineer takes into account when he selects lubricants for your equipment. His stock in trade is a lubricant to meet your every need . . . his function is to select the right one for each job.

From his experience, the Shell Lubrication Engineer can help you when something's wrong and needs quick attention—and he can help prevent trouble by analyzing your equipment right now to see that you are getting the benefit of all that's new in lubrication.

Call him any time. He's a good man to know.

SHELL

SHELL OIL COMPANY, Incorporated
50 West 50th Street, New York 20, New York
100 Bush Street, San Francisco 6, California

American Machinist's Spot NEWS OF METALWORKING

Germany's metalworking manufacturers are offering special incentives to workers by developing an elaborate system of distributing scarce consumer goods and supplementary food. This practice has long since become part and parcel of labor-management relations. Performance of plants in occupied areas depends largely on the ability of management to carry out this system.

Television manufacture and sale will come into its own during '47. The industry expects to sell several hundred thousand sets next year. Since sets have to be inspected 10 times as much as regular radio sets, cost of television inspection at the factory is very high.

Sheet steel has been offered to big users in quantities as high as 100,000 tons by brokers and other agents who pretend to have access to huge mill tonnages during the coming year. Prices asked are as high as $100 a ton over the regularly accepted market quotations. Upon investigation by users, the proposed deals have faded out and mills know of no such tonnages.

War Assets Administration is launching a big program for selling surplus machine tools abroad. A plan for U. S. builders to buy surplus machines, rebuild them and sell them in other countries is part of the program. The builder is to get whatever he can for the rebuilt machines, plus a commission allowance of 12½% on the price he paid WAA for the machines. WAA is taking large paid space in export and foreign language papers to back up the program.

> **Portal-to-portal pay will become a lively issue in the next Congress when a bill will be introduced either outlawing it entirely or putting severe curbs on its application. Those who framed the present Wages-and-Hours law did not contemplate its inclusion of portal-to-portal pay. Observers feel that Congress will take favorable action on the proposed legislation.**

Sprayed plastic coatings are now being used for packaging machinery destined for foreign delivery. A heavy-duty three-drum sander for a Brazilian customer was the first so treated. This kind of coating heretofore has been confined largely to ordnance and aircraft items intended for long-term storage by the Army and Navy.

British motor car makers are experimenting with so-called "minicars" or miniature cars the size of the former German Volkswagon. Nuffield is reported testing such a car. Grantham Productions has built a prototype of a 1,047-lb. car with air-cooled engine of two cylinders horizontally opposed. Car seats four, has top speed of 60 mph., runs 60 miles on a gallon, has aluminum alloy frame and engine mainly of light alloys, with steel cylinder liners and crankshaft.

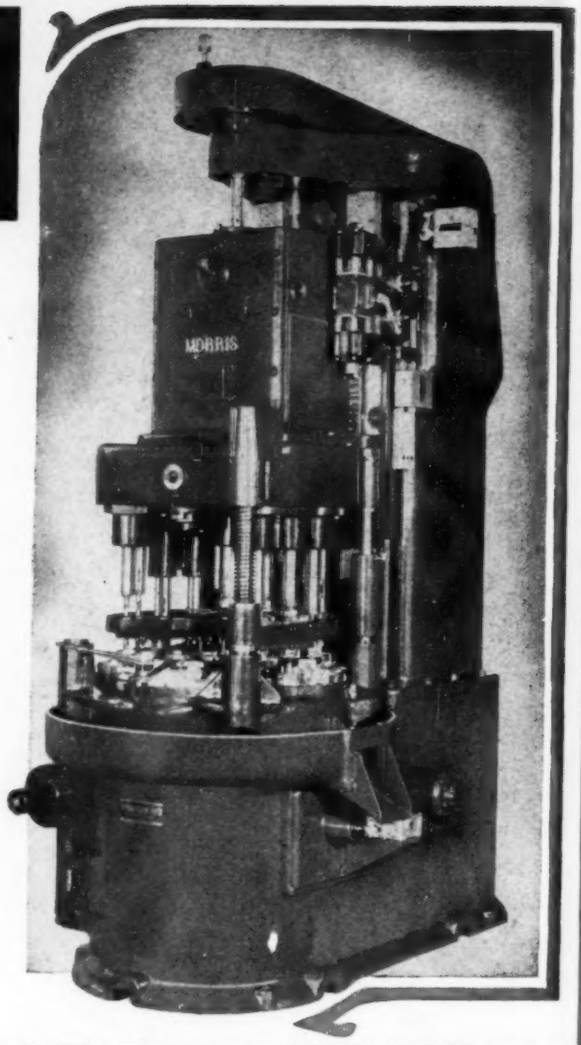
Price escalator clauses in government contracts are expected to be harder to get. Last week the government's Advisory Committee on Procurement Policy branded the use of escalator clauses "a remaining evil of contracting procedure born under the pressure of war."

Aluminum coils are now being brazed successfully to copper sheets. Proper control of the temperature is the secret. This process is being used by one of the nation's biggest manufacturers.

Army and Navy are eager to retain the system of negotiated buying which sprung up during the war. Most of the Army's research and development contracts are still awarded on a negotiated basis under the First War Powers Act. The negotiated-contract system is flexible, economical and efficient. Hence Army and Navy have sent to Congress a joint bill calling for permanent procedures along this line. Keep in mind that the services spend $6 now for every $1 prewar.

(Further news on pages 109-120)

MORRIS MOR-SPEED
Production Equipment



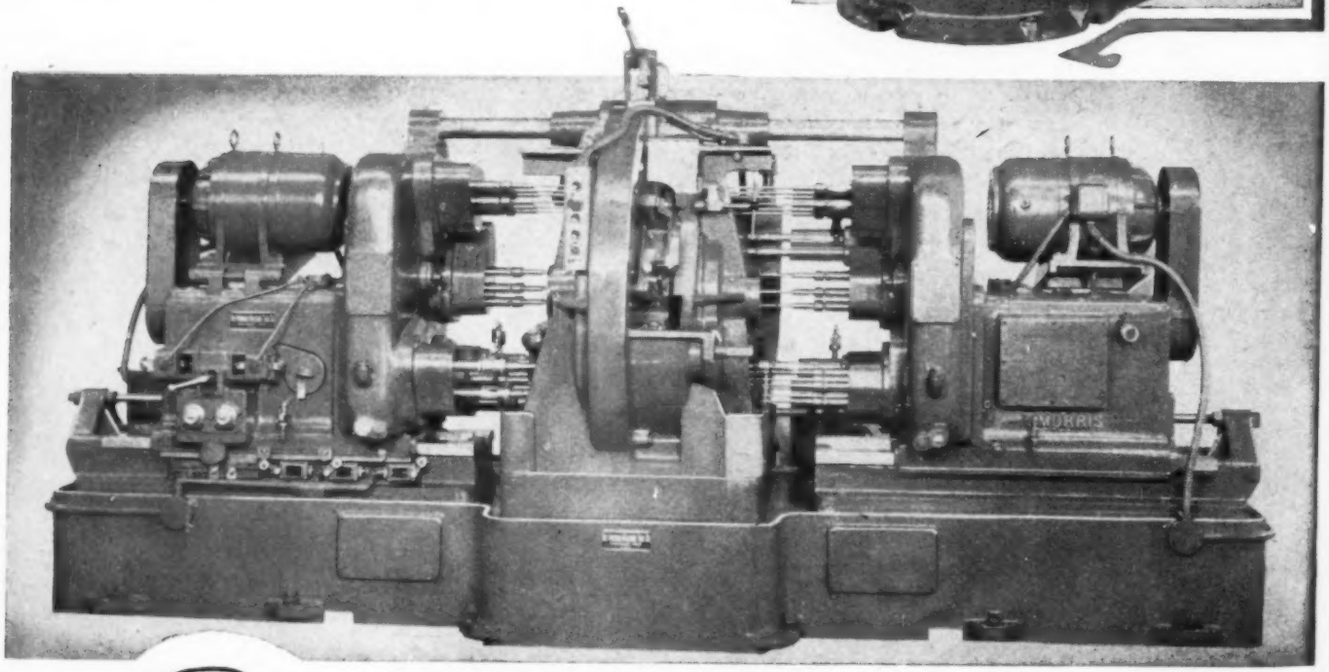
Developed to meet job conditions—increase output—reduce operating costs

The two illustrations show how Morris Engineers successfully handled two entirely different job requirements—obtained desired production—reduced costs.

At the right is a 4-station vertical, automatic indexing machine with standard self-contained hydraulic feed unit operating 14 spindles to accurately drill, ream and counter-bore steering wheel hubs . . . The self-contained hydraulic feed unit is unique in that it can be used in any position and provides a wide variety of approaches and returns as well as feeds and speeds—and is fully automatic.

Below is a horizontal two way machine. The machine consists of two 10 H.P. hydraulic feed units mounted on opposite ends of a rigid base. Fourty-four spindles are mounted in clusters for drilling, boring and reaming an oil pump body from two directions. The work is rigidly held by five hand clamp fixtures and indexing is also accomplished by hand.

If you have a mass production problem involving drilling, reaming, boring and similar operations—consult Morris Engineers. They have the *"know how,"* the experience, the facilities to help you.



Builders of MOR-SPEED Radials

The MORRIS Machine Tool Co.

CINCINNATI 3, OHIO

ESTABLISHED 1877

American Machinist

BURNHAM FINNEY, Editor

The Big "IF"

Nineteen forty-six was hardly a year to be proud of. As we look back on it, we believe that its violent upheavals could not have happened anywhere else than in the United States.

The year opened with hopes high for big industrial production. But those hopes went glimmering when the tidal wave of strikes inundated the country. Though most of the stoppages occurred in the first half of the year, the after-effects have been felt clear up to the present writing.

Instead of production, we had strikes. Instead of a mighty flow of goods to help stem price rises, we had a sluggish movement. Instead of lower costs, we had higher costs. Instead of lower prices, we had higher prices. Instead of leadership, we were leaderless most of the time.

Yet there was a plus as well as a minus side to the year. We finally got rid of the controls which hemmed in and hampered industrial production. The people demonstrated at the polls in no uncertain terms that they were tired of too much bureaucracy and of dictatorship. Mr. Lewis learned to his dismay that the government will not tolerate the nation's being at the mercy of a labor official.

As we enter a New Year, there is much promise ahead. The country still needs lots of goods. Our industrial plants are ready to produce them. If goods could be poured out of our factories in unceasing quantities, as they readily can, we would be on the road toward balancing once again demand and supply. We soon would be in a buyer's market again in many goods, and close to it in others.

Therein lies the big hope for bringing down the cost of living from the peak to which it has climbed. But a giant "IF" remains.

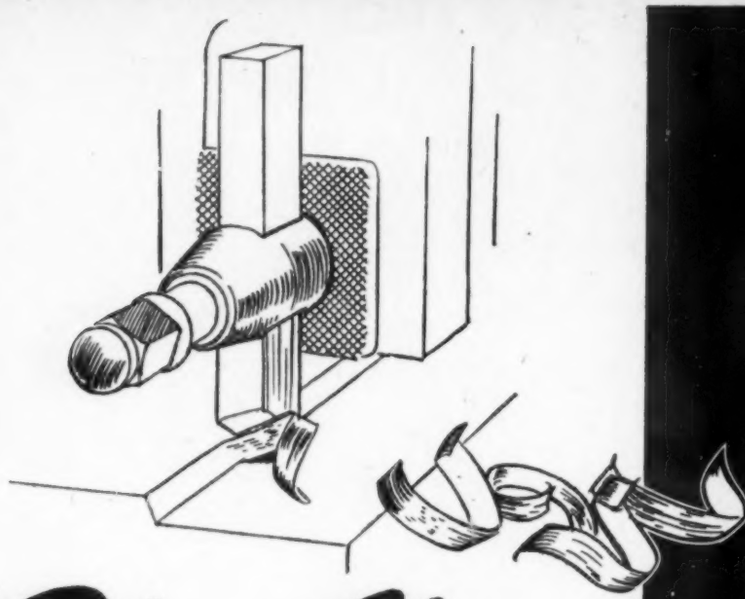
These accomplishments can be achieved only IF labor refrains from a repetition of the paralyzing strikes of 1946. Labor cannot but see and recognize the futility of spinning round the upward wage-price spiral once more.

Management has its faults, to be sure. We do not pose as an apologist for management. But we firmly believe that management wants more than anything else in 1947 uninterrupted production of goods and full employment. To attain the goal, management is ready and willing to pay high wages. Management is eager to "go to town."

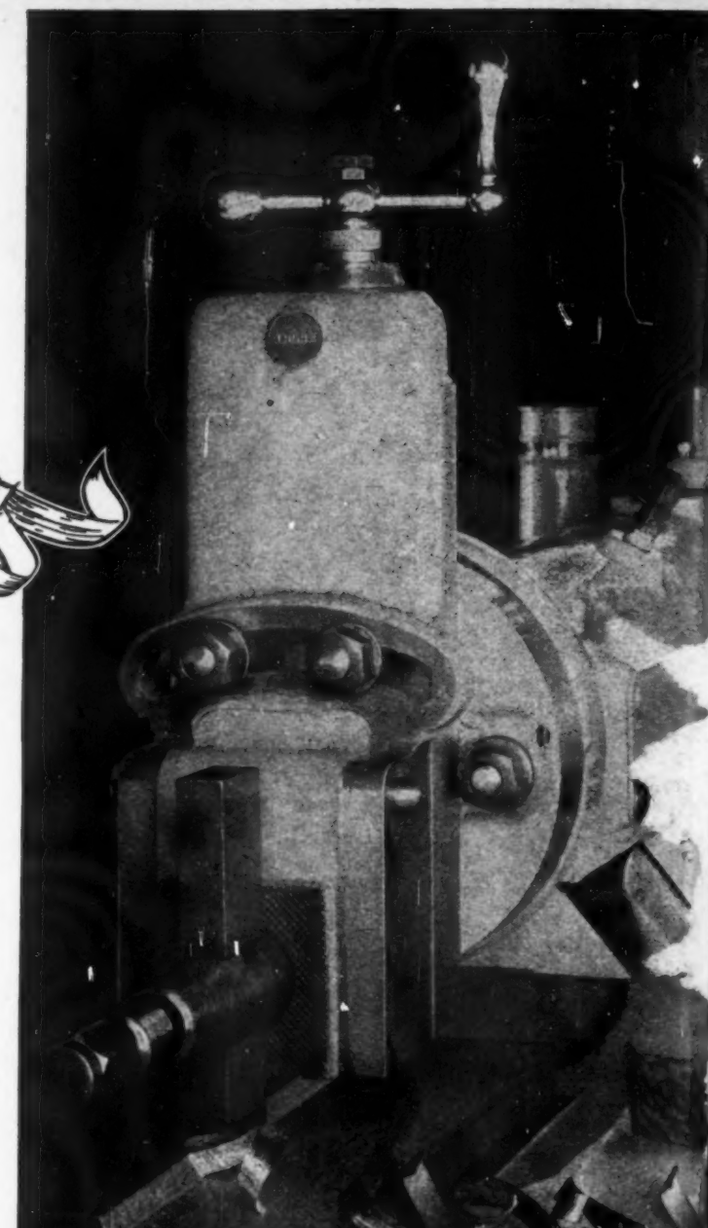
Whether it does or not will depend in large measure upon organized labor. Many labor leaders, particularly in the American Federation of Labor, know just that. By maintaining in the coming months a fair and reasonable attitude, especially restraining the rank and file from rash strike actions, organized labor will do itself, its members, industry and the country a valuable service.

Free from strikes, 1947 may well go down in history as a year of high production when price inflation was dealt a staggering body blow.

Burnham Finney



Blue Chips



Cincinnati Shapers cut blue chips that are profitable chips. Blue chips come from tough die steels that present unusually tough machining problems.

The machine must be accurate in performance, must deliver unusual power at the cutting tool, and must have great stamina. On these things hinges the profitable handling of these tough steels.

Cincinnati Shapers, with their outstanding performance, are found in large numbers in tool and die plants everywhere.

Our representative in your neighborhood will gladly consult with you on increasing accuracy and profit in your shop.

Our Engineering Department is at your service. Ask their advice on your shaping problems.

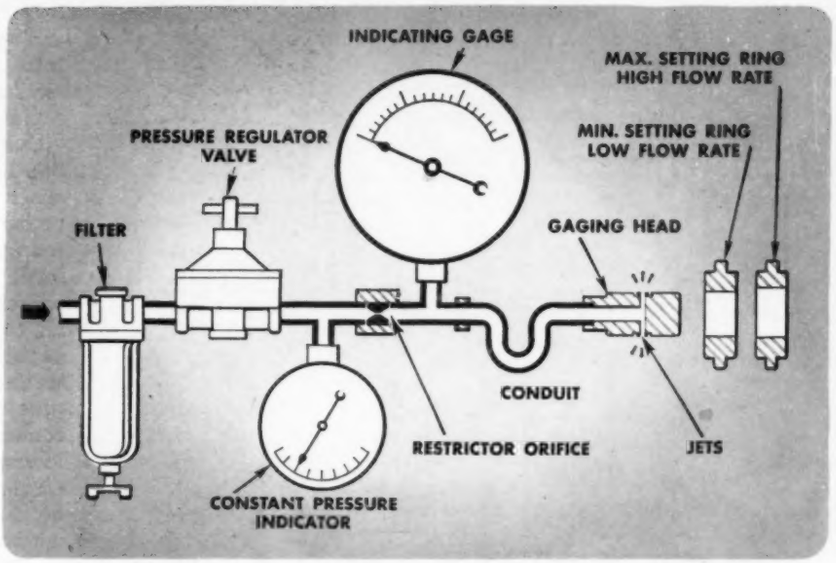
Write for Catalog N-3

• **THREE TIMES AS TOUGH . . .**
By test, die steels are often three times as tough as mild steel—and machining demands are correspondingly more severe.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES



Principle of mechanical back-pressure air gage. Back pressure is controlled by ratio of orifice to air escaping when the gaging head contacts maximum or minimum part

ESSENTIALS OF AIR GAGING

A constant-pressure type of air gage and other developments of recent years have increased the value of air gaging to industry

BY W. FAY ALLER
DIRECTOR OF RESEARCH, THE SHEFFIELD CORPORATION

THE ART OF physical measurement by means of air flow is not new. It is possible that it dates back to 10,000 B.C. when the ingenious and fictional Mog developed the blow-gun to provide small game for dinner. His ancient bean shooter probably consisted of a long wooden tube through which he blew a sharpened projectile with an accuracy dependent upon the quality of his equipment.

He probably noticed that when the diameter of the blow-gun bore was substantially larger than the diameter of the projectile, the greatest puff of wind he could emit furnished a very unsatisfactory trajectory.

He further observed that when an appropriate clearance existed between the projectile and blow-gun bore, he obtained excellent results. He may at that time have adopted a functional inspection of his blow-guns by experimental blasts of breath through the gun with his darts in position, meanwhile feeling the passage of air with his hand as a means of determining whether he properly sized the bore or darts.

Ignoring this flight of fancy, recorded patents, both here and abroad, indicate the origin of the air gage to be approximately 25 years ago. Nevertheless, many of the important developments date back no more than seven years.

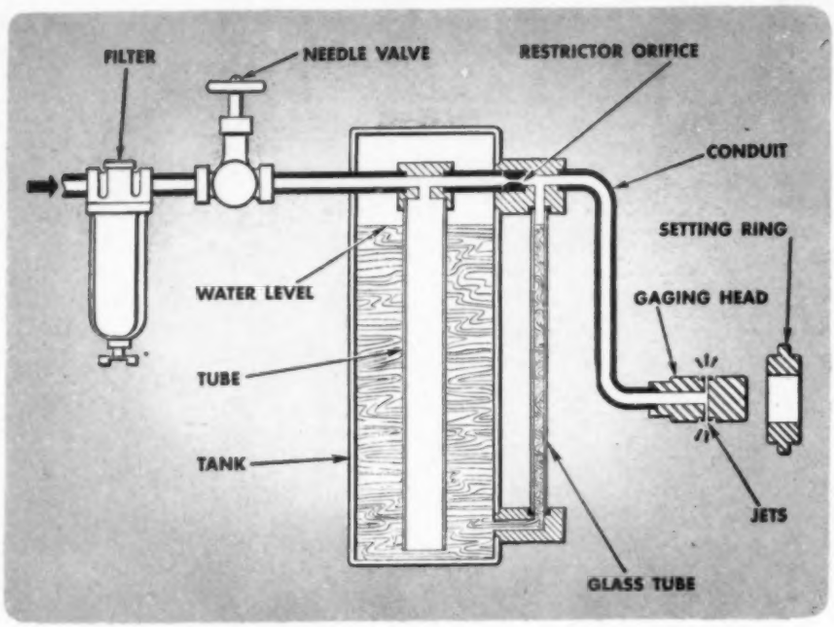
Measurement by Airflow

Essentially air gaging depends upon the flow of air between the faces of jets or specially constructed heads and the part being gaged. In exceptional cases, however, plungers, balls or levers may make physical contact with the part, forming a variable aperture through which the air flows, giving a value.

In its originial fundamental form, the air gage consisted of an air supply of constant pressure entering an orifice of pre-determined size connected to the gaging head with suitable conduit. In this conduit was placed a pressure-indicating gage The fit of the part on the gaging head formed an opening varying in size according to the size of the part being measured. A closely fitting part restricted the air flow more than a loosely fitting part, setting up a relative back pressure. This back pressure actuated the pressure indicator, giving a reading which was interpreted into a linear dimension.

We shall refer to gages depending upon this varying pressure at the gaging head as "back-pressure type air gages" and they consist of the following two classes: the mechanical back-pressure air gage, and the water-column back-pressure air gage.

The mechanical back-pressure air gage normally consists of first, a filter to remove excess moisture and other foreign materials which might soil the part being gaged or foul the small orifice through which all the air must pass; second, a me-



Water-column back-pressure air gage is similar in operation and theory to the mechanical type. Simple design, however, eliminates most of the mechanical units

chanical pressure regulator valve through which air passes to give a constant pressure. This valve is usually of the spring-balance diaphragm type.

Ordinarily with a constant pressure presenting air to given-size orifice, one would expect a constant rate of flow. It will be well to note that in this case this is not true, as the varying pressure between the orifice and the gaging head exerts a back pressure that decreases or increases this flow. This back pressure is controlled by the ratio between the orifice and the escape permitted by the engagement of the gaging head with a maximum or minimum part.

Pressure Considerations

It is obvious that a pressure must be established in the conduit that will allow exactly the same amount of air to flow from the jets as will enter the conduit, under a constant head at the orifice against this established pressure. The process of balancing these flows against one another is automatic, and the lag is the product of the proportion between the volume of the conduit and the rate of flow at the gaging head.

If the conduit is extremely small and the rate of flow at the gaging head great—as in the application of a low-amplification gage setup with the gaging head very close to the instrument — balance takes place quickly and speed of indication is remarkably good. If, however, the gaging head is used at a greater distance from the instrument, increasing the volume of the conduit, this indicator reaction will slow.

Likewise, if the rate of flow is decreased as by reducing the clearance between the gaging head and the part—as required to get a greater gage amplification—the speed of indication is decreased. Therefore, very definite limitations in both amplification and remote gaging are imposed to retain an acceptable sensitivity or speed of indication.

The water-column back-pressure air gage is identical to the mechanical back-pressure gage in operation and theory but differs in the method of accomplishment. It consists of a vertical tank of water into which a tube has been inserted with an open end near the bottom of the tank. Into the upper end is introduced the air supply, sufficient in quantity to remove all water inside the tube.

Surplus air bubbles out, keeping this level at the bottom of the tube constant. This establishes a constant pressure in the tube that may be changed only by changing the water level in the tank. At the upper closed end of this tube is an orifice allowing air to enter a conduit leading to the gaging head, as in the previously described gage. A small vertical glass tube has one end connected to this conduit and the other end to the lower portion of the water tank. Obviously this tube will indicate the height of the water level in the tank when atmospheric pressure prevails in the conduit.

Increasing back pressure in the conduit depresses the water level in the glass tube, making a direct-acting pressure indicator. This system has the same functional limitations as the mechanical back-pressure gage, plus practical limitations on gaging pressure. Because of the height of water tank necessary, this gage seldom operates at over 1 lb. pressure. The simple design eliminates most mechanical units.

Limitations Reviewed

Limitations imposed by back-pressure gages offered a real incentive to find a more direct principle. As a result, about six years ago the constant-pressure rate-of-flow air gage was invented. Its simple construction and direct operation eliminated the time lag formerly encountered and provided maximum sensitivity and amplification.

The original was made up of a filter which removed foreign material and moisture from the air sup-

POINTS ON AIR GAGES

The modern air gage is a proved device of extreme accuracy that may be used:

1..Independently of operator skill.

2..Usually without the necessity of cleansing parts.

3..With gaging pressures sufficiently low to avoid part deflection.

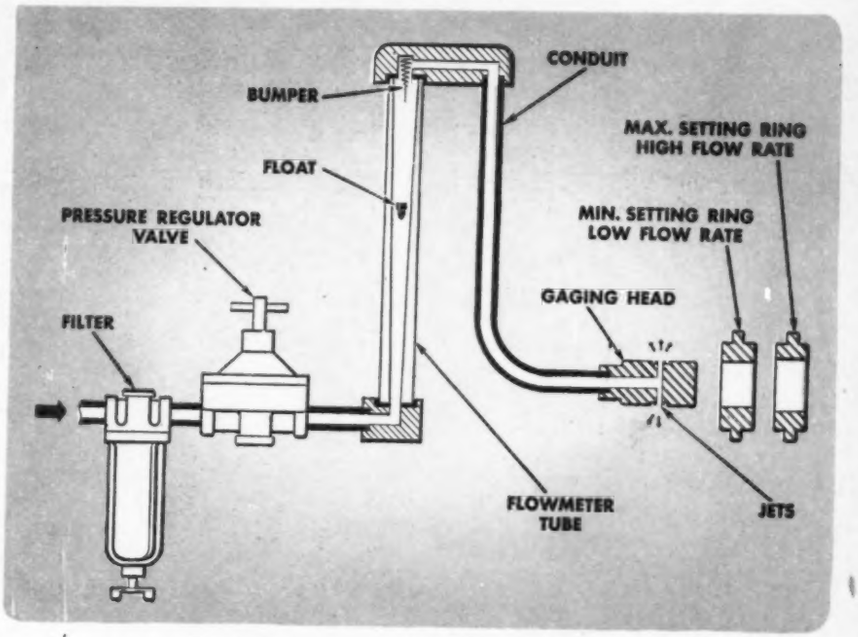
4..Without marring soft polished surfaces.

5..Without loss of accuracy because of gage wear.

ply. Next, a pressure regulator valve maintained a constant predetermined pressure of the cleansed air. The radical departure from previous methods consisted of elimination of the former orifice and pressure indicator, and provided only a rate-of-flow meter between the valve and the gaging head.

The rate-of-flow meter employed consisted of an internally tapered transparent tube—positioned vertically with the large end upward. A lightweight, specially designed metal float positioned itself in the taper according to the velocity of air passing through the tube. The float position was a direct rate of flow indication. You will note that no restriction occurred between the regulator valve and the gaging head, therefore, the pressure presented to the part at the gaging head was constant.

The pressure-regulator valve used had a capacity much greater than was needed to insure a nearly constant pressure to the gaging head, even when no part was in place and flow was considerably greater than was ever used in gaging. Therefore, any change in flow at the gaging head—as caused by putting on or removing a part—effected exactly the same and simultaneous change of flow at the flowmeter. An instantaneous indication resulted. This has been verified by installations where the gaging head was as much as 50 ft. from the instrument with no apparent time lag in indication.

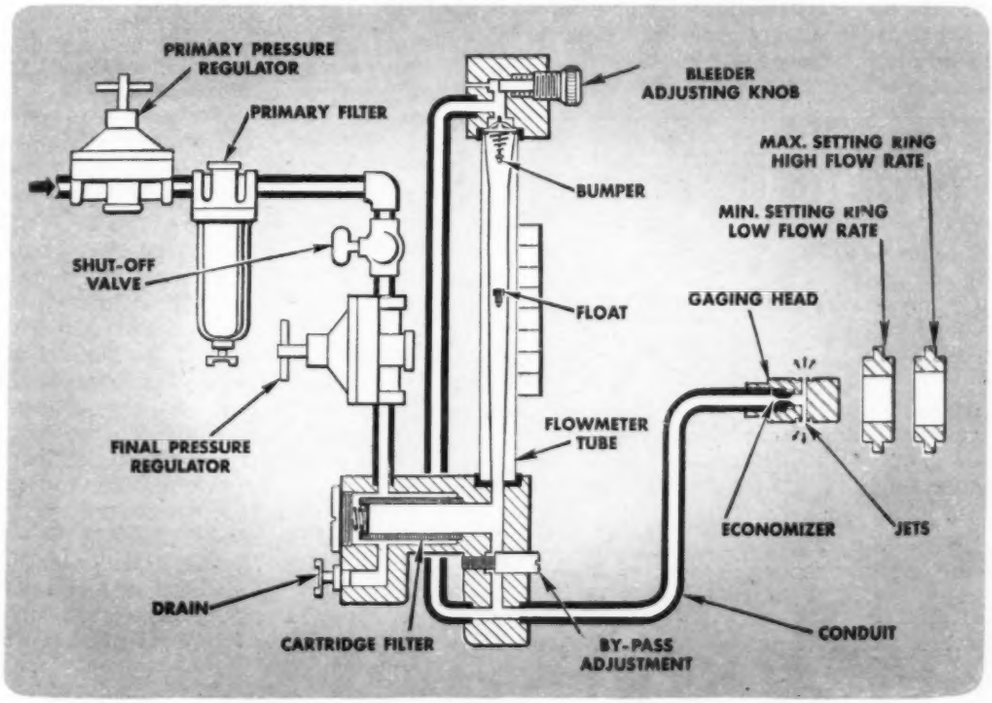


Constant-pressure rate-of-flow air gage was developed to overcome limitations of the back-pressure type. Maximum sensitivity and amplification resulted

Although no changes have been made in the basic fundamentals of the constant-pressure rate-of-flow air gage since its inception, many improvements have been applied to increase its value to industry.

The improved system has a regulator valve inserted between the air supply and the filter. This valve is set to maintain a pressure of only several pounds above the gaging pressure to avoid wide fluctuations from approaching the final regulator. It also allows the improved filter to remove most of the moisture condensed due to the pressure drop.

Pressure regulators are of a specially improved design to eliminate hysteresis, to add to its sensitivity and to give a long, trouble-free life of constant-pressure delivery. Another small cartridge-type filter is used after the final pressure regulator to remove any condensate re-



Improved constant-pressure rate-of-flow air gage incorporates a regulator valve between the air supply and filter to maintain pressure and prevent wide fluctuations from approaching the final regulator

Air Gages are Economical Because:

1..Wear life is extremely long.

2..Unquestioned accuracy prevents costly mistakes and arguments.

3..Accuracy prevents scrapping of many good parts as well as preventing the use of many bad parts.

4..Ease of operation allows use of lower-skilled operators and inspectors.

5..Speeds inspection without loss of accuracy.

6..One operator may do the work of many by means of multiple applications.

AIR GAGING ESSENTIALS
continued

sulting from the final pressure drop as well as any that might have passed the first filter.

At the entry of the flowmeter tube is an adjustable bypass valve. Air is diverted from the flowmeter tube and allowed to enter the conduit leading to the gaging head in any proportion desired to that passing through the tube. An amplification adjustment of a very wide range and high sensitivity is the result.

A simple example for clarity might be used. Assume that an increase of 1 cu. in. per sec. air flow at the gaging head will cause the float to rise 1 in. when the bypass is closed. If ½ cu. in. per sec. is diverted from the tube by sending it directly to the gaging head by means of the bypass, the float will rise only ½ in. because only half of the increased air flow will pass through the tube.

At the top of the tube a sensitive bleeder is provided which allows any desired amount of air to reach the atmosphere without passing through the gaging head. As opening the bypass causes the float position to fall as well as to decrease amplification, the float may be repositioned by opening the bleeder. This permits the float to be placed at will.

The combined use of bleeder and bypass allows positioning of the float with a maximum master and a minimum master to suit the printed scale alongside the tube and to retain this position throughout the life of the gaging head.

The float design is improved to give better stability, easier reading and longer life. Any possible effects of static are eliminated by the adoption of a spring-cushioned grounded metal bumper in the top of the tube. The tube design and manufacturing process has been improved to insure consistency of readings from one tube to another as well as precise linearity throughout the gage scales.

An increased taper in the upper two inches of the tube is used in conjunction with an economizer in the gaging head. The economizer, so-called because it effects a saving in air consumption of approximately 80%, is an orifice of predetermined size placed as near as possible to the jets in the gaging head. It allows the passage of enough air to measure with the greatest flow requirements plus an additional amount for a factor of safety.

The amount of air that can pass through the economizer, however, is not sufficient to cause the float to ride the bumper. As a result the upward velocity of the float is retarded by the tube and economizer combination and in operation the quick removal of a part from the gaging head, causes the float to hit the bumper only lightly from inertia, then drop midway in the large taper, suspended only in air.

Longer float life, elimination of the possibility of sticking and increased speed of operation make the economizer combination one of the outstanding developments of this system of gaging.

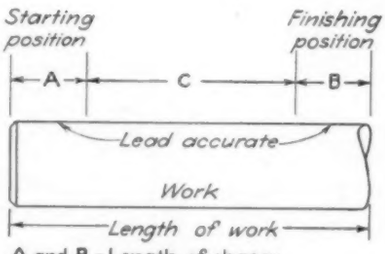
Ed. Note: Applications and multiple gaging operations will be described in a forthcoming article by Mr. Aller.

Thread Troubles and How to Cure Them

By ARTHUR E. LYNCH
Oregon, Wis.

In a recent issue, Mr. H. Schlarman omitted at least one important trouble that one encounters occasionally in using dieheads—lead error caused by the lateral play in most dieheads.

On several occasions I have had work that required lead accuracy of ±0.0001 per in. For instance, one job, a 1⅜-12 thread calibrating screw, had a bearing of 6 in. in its mating part. When this job was first attempted on a turret lathe, we found that the first inch and the last inch of the thread had perfect lead, proving the chasers were all right.

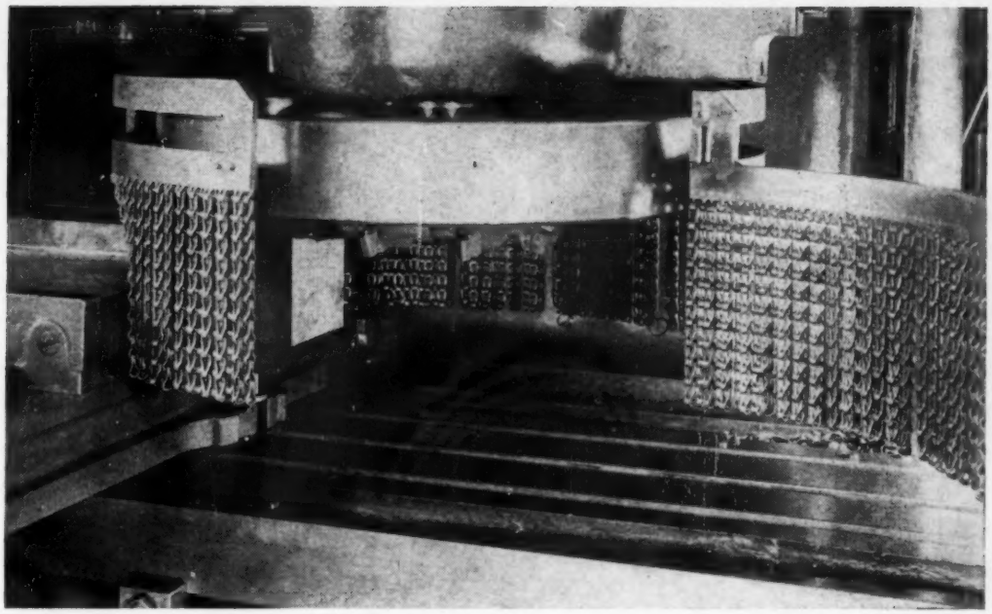


A and B = Length of chaser
C – in this space, lateral float of chasers or die head causes errors in lead

We then checked the lead screw that actuated the turret and found it to be 0.0002 in 10 in. This was a hardened and ground screw. Between the first inch and the last inch, the diehead wandered back and forth at will, resulting in considerable changes in lead.

By eliminating all the lateral float, except the clearance required to trip and reset the head, we obtained very accurate threads.

A similar case came up recently and when our diehead man seemed stumped, I called this fact to his attention, and it proved the correct solution.



FLYING CHIPS from face mill can be stopped by a flexible chain guard. Even though chains ride over top surfaces of the work, upper part of chains provide adequate guarding

Behind the Steel Curtain

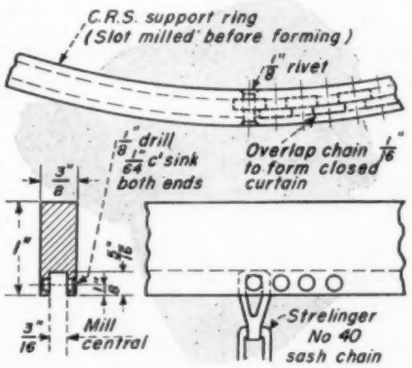
BY RALPH M. SMITH
Factory Engineering Department, Carboloy Company

FLYING CHIPS from high-speed face milling operations are a serious hazard to the operator and anyone passing his work station. This problem may be overcome to some extent by placing floor-mounted metal screens around the milling machine to stop the chips before they leave the work area, but such shields interfere with the free flow of work through the department and are never entirely satisfactory.

An effective and satisfactory guard, developed for use in Carboloy Company's machine shops, consists of a large ring from which are suspended overlapping lengths of steel sash chain. This guard is particularly adapted for use on vertical milling machines. Various design modifications in location of mounting brackets and adjustability of guard position have been made to permit its use with vertical millers of different makes, types and sizes.

Bracket supports must be capable of quick removal and replacement so the setup man can readily remove the guard for changing cutters. As removing and replacing screws is too slow, a latch type of mounting should be used. Support rings and bracket members are made from SAE-1020 cold-rolled steel, the support rings usually being formed from 1- to 1¼-in. wide and ⅜-in. thick bar stock. A 3/16-in. wide slot is milled 5/16 in. deep along one edge of the bar before it is formed to the required shape.

For the guard shown, the support ring is formed in a complete circle to enclose the large flywheel carried on the end of the vertical spindle, with ½-in. clearance between the flywheel and the support ring on all sides. In other cases, the support ring is U-shaped for mounting on brackets bolted to the vertical column of the milling machine. The U-shape may be necessary either for adjustability of mounting or because of location of the mounting brackets.



Upper link of each chain is riveted in a milled slot of the support ring. Chains are overlapped 1/16 in. to form a closed, yet flexible curtain around the entire ring

Guards of this type used on production operations have solid support rings to insure that the cutter is guarded at all times. The chain guard, however, made for the vertical mill in the research laboratory has a gate to permit easy inspection of cutter teeth after each test run.

Size and shape of the support ring, its location with regard to the cutter, and length of chains must be considered when setting up a milling job on a machine protected with one of these guards. The support ring must be located so the chains cannot touch the revolving cutter when they are lifted out of hanging position by the passage of the work piece through the chain curtain. If one of the chains were to be snagged by a passing cutter tooth, the entire guard assembly probably would be torn from its support brackets.

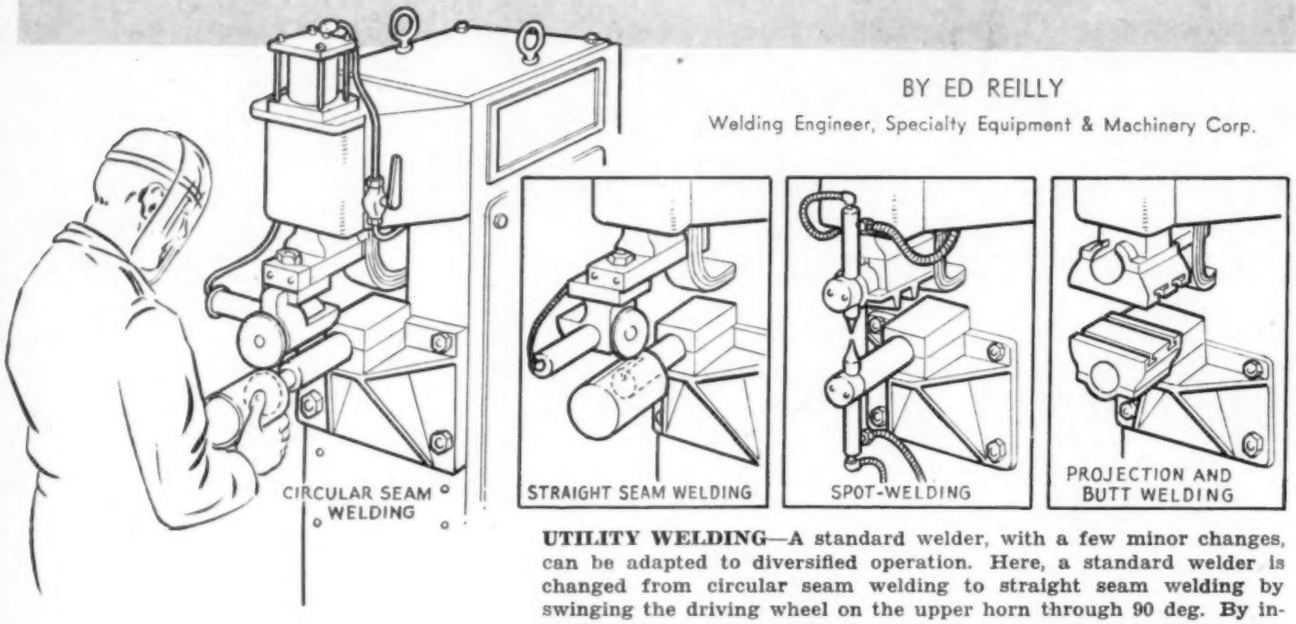
Principal disadvantage of this guard is that the operator can neither watch the cutter at work nor see the approach of the work to the cutter. The guard, however, is not used while setting up the job and from there on the operator does not have to watch the cut. Appearance of the work surface after it has passed under the cutter shows if the cutter is dull and needs resharpening.

Fixtures Make Welders Flexible—2

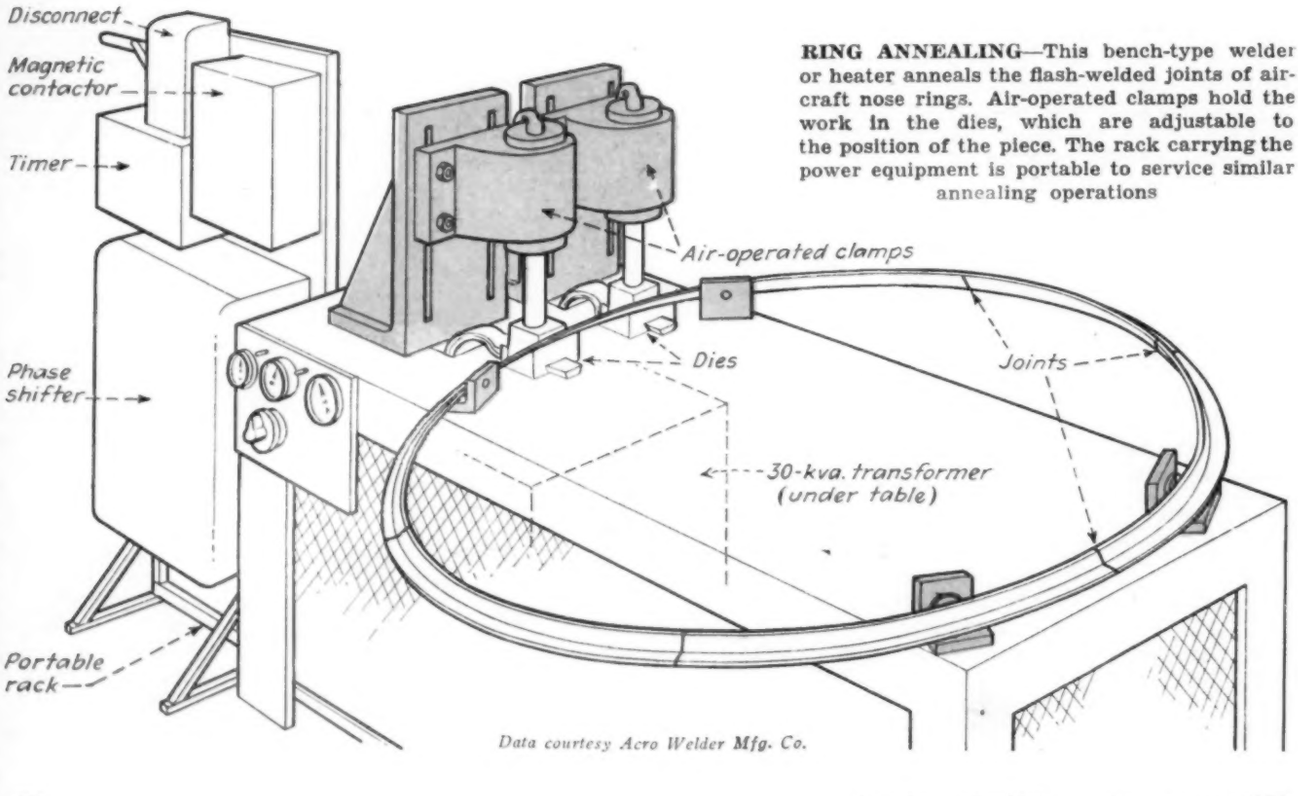
The range of work that can be readily assembled by standard welders is limited only by the designer of jigs and fixtures . . . Here are a few cases in point

BY ED REILLY

Welding Engineer, Specialty Equipment & Machinery Corp.

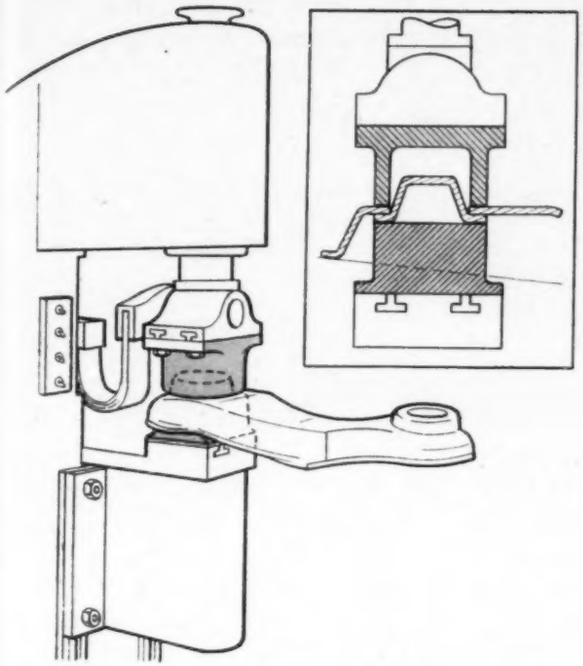


UTILITY WELDING—A standard welder, with a few minor changes, can be adapted to diversified operation. Here, a standard welder is changed from circular seam welding to straight seam welding by swinging the driving wheel on the upper horn through 90 deg. By installing the required electrodes on the upper and lower horns, spot welding can be done. Suitable platens convert the unit for other jobs

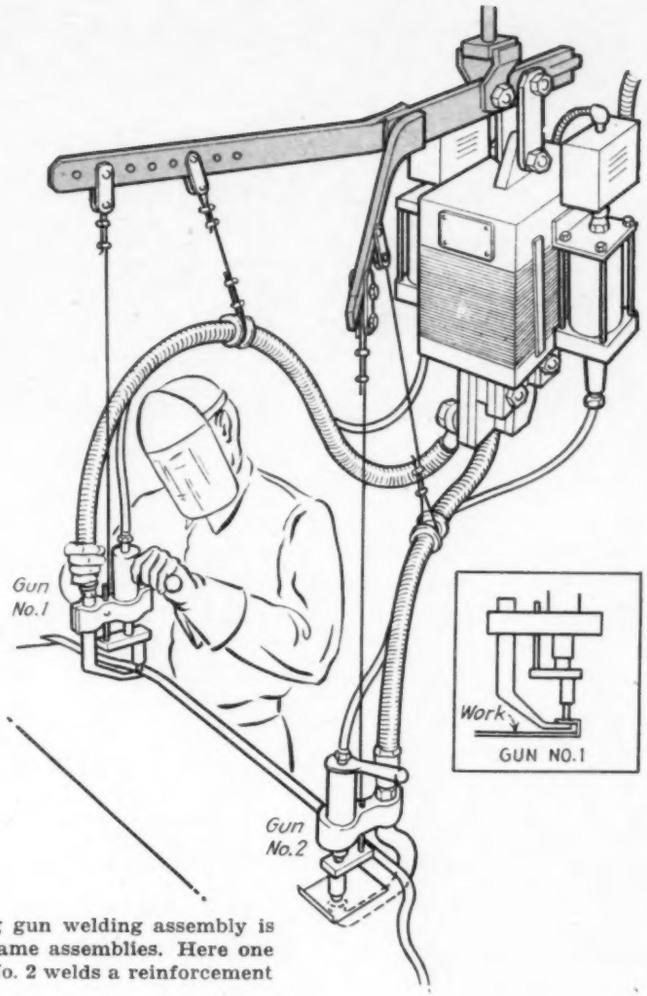


RING ANNEALING—This bench-type welder or heater anneals the flash-welded joints of aircraft nose rings. Air-operated clamps hold the work in the dies, which are adjustable to the position of the piece. The rack carrying the power equipment is portable to service similar annealing operations

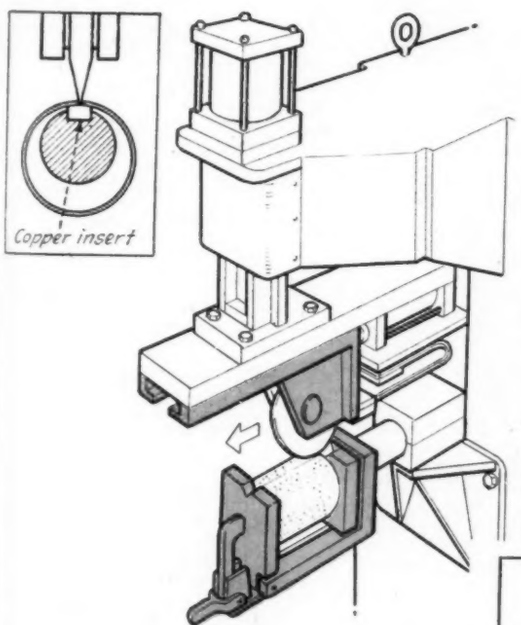
Data courtesy Acro Welder Mfg. Co.



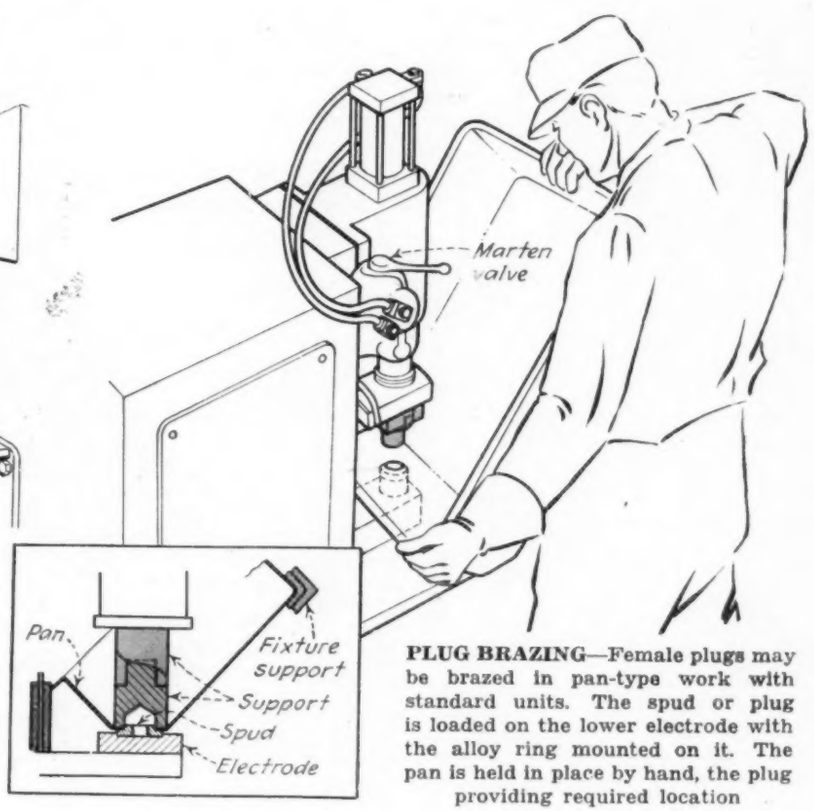
PROJECTION WELDING—Front-end suspension units of the 1946 Nash car lend themselves to fabrication by projection welding. Heavy-duty electrodes, specifically designed for the job, give long life in this type of mass-production welding and the unit itself is built for maximum rigidity



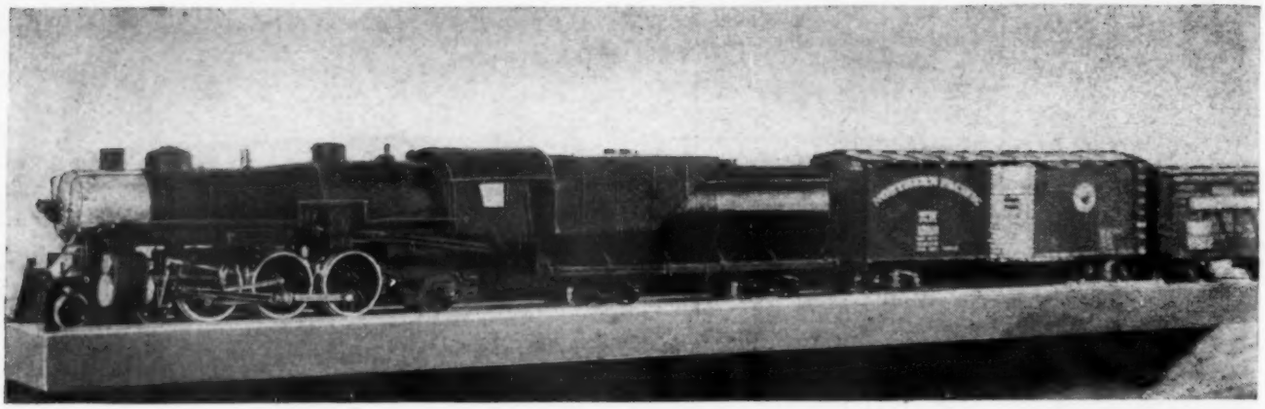
DUAL GUN WELDING—A swinging gun welding assembly is suitable for local welding of large frame assemblies. Here one gun welds a corner patch while gun No. 2 welds a reinforcement



UTILITY FIXTURE—Perforated oil burners are now being produced at a rate of 600 an hr. with this seam welder, replacing two flash welders producing 150 an hr. each. Two sizes of burner are taken in the fixture, 5 sec. being required for changing from 3- to 4-in. dia. assemblies



PLUG BRAZING—Female plugs may be brazed in pan-type work with standard units. The spud or plug is loaded on the lower electrode with the alloy ring mounted on it. The pan is held in place by hand, the plug providing required location



TIME passes much swifter for prisoners at San Quentin when they keep occupied on interesting activities. With plenty of time on his hands, an inmate engaged in some intricate machine work to turn out this model locomotive measuring 6½ in. over-all. He made it from drawings appearing in an illustrated dictionary

The Prison Machine Shop

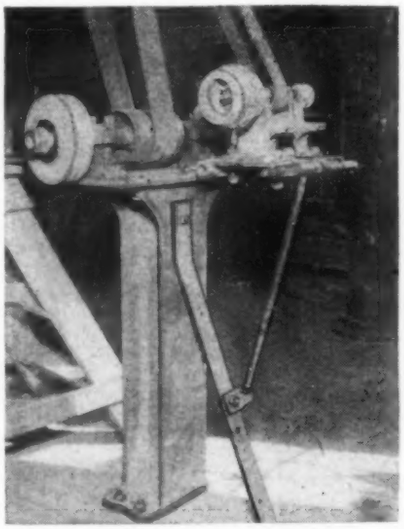
BY W. LEWIS JOHNSON

MACHINISTS ARE MACHINISTS even though they are imprisoned for debts to society. The author, an inmate of Nebraska State Penitentiary, points out how inmate machinists repair and maintain the very locking mechanisms which keep them confined. He reveals some mechanical know-how used by prison machinists in devising machine tools from odds and ends in the shop

THE DAY-BY-DAY OPERATION of the average prison depends a great deal upon the ability, ingenuity and inventiveness of the inmate machinists for upon their shoulders falls responsibility for the maintenance of all power and hand-operated machinery in the prison industries; and repair of the various types of equipment used in the prison bakery, laundry and cannery. Another responsibility not found in the "outside" machine shop is the care and repair of the many intricate locking mechanisms and the maintenance of the huge, electrically operated steel gates.

Since our machine shop is small and we are handicapped by lack of modern equipment, our inmate machinists have been forced to design and construct many of their working tools and special equipment out of odds and ends salvaged from broken machinery. Now, they not only have a fairly complete machine shop, but facilities for welding, plumbing and electrical maintenance are provided in the same building.

Included in the machine shop equipment are an old 36-in. Prentice lathe, drill press and power saw. In addition to these indispensable tools, the inmate machinists have built a dual grinder, band saw, drum sander, circular saw and a miniature wood-working lathe. Welding is done by the usual oxy-acetylene method. The cabinets house working tools and supplies. Work benches are constructed of 2-in. planks attached to a welded base made from 1½-in. pipe.

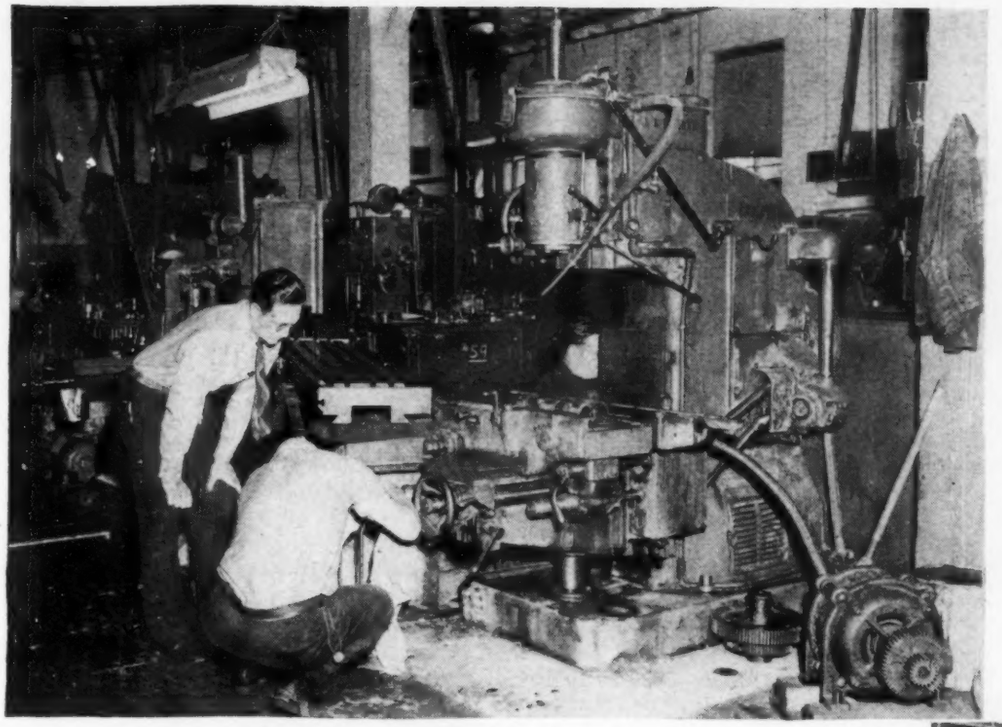


COMBINATION GRINDERS for simultaneous work. The small sickle grinder is on an adjustable table and can be swung down out of the way

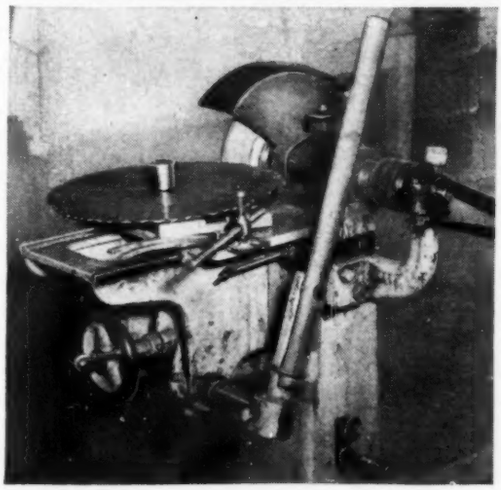
A portable hoist frame has many diversified uses. Simple, and easy to make and now being fitted with dual-wheeled casters, this portable hoist will facilitate the lifting and moving of heavy parts and machinery in the prison garage. The frame is constructed of extra-heavy pipe and all joints are welded.

A 3-in. pipe forms the horizontal crosspiece to which the hoist is attached with a heavy U-clamp, forged from ¾-in. stock. Vertical members and the base legs are of 2-in. pipe; 1½-in. pipe was used for the braces, top and bottom. The frame is 8 ft. wide and 7 ft. high. The maximum load to which it has been subjected thus far has been 1875 lb.

A combination grinder, another inmate idea, offers several conveniences not available on standard grinding equipment. It, too, was constructed from scrap found around the shop. The base is made from a piece of 6-in. I-beam and is so heavy that vibration is hardly perceptible. A ⅞-in. section of boiler plate is bolted to the I-beam and forms a base for the grinder. The 1⅛-in. grinder shaft turns in bronze

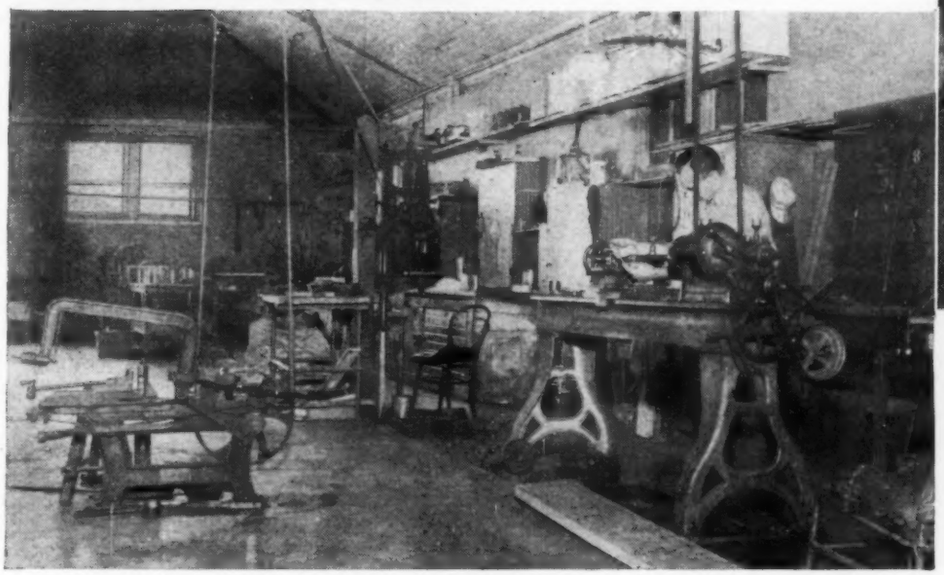


A MILLING MACHINE is a milling machine regardless of its assignment behind prison walls at San Quentin. Mr. Bailey, instructor at left, observes prisoners as they turn out work on the milling machine

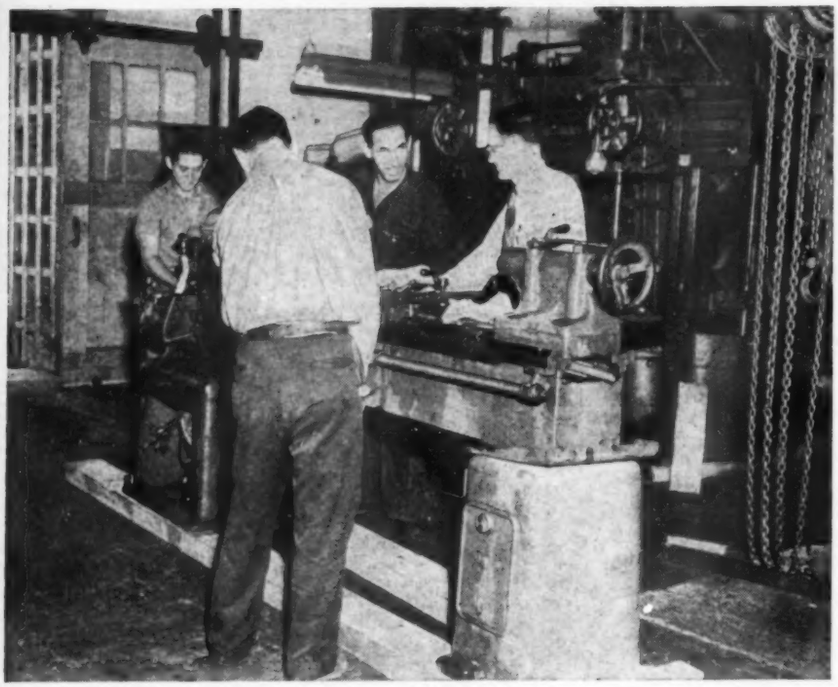


← MECHANICAL INGENUITY resulted in a special saw gummer and grinder mounted on an old wood borer base. Used in the furniture factory, the machine gums and sharpens saws from 3 in. to 3 ft. in dia. Saw blades can be adjusted and positioned for most any angle

→ MATERIALS HANDLING problems led inmate machinists to develop this portable hoist frame, since fitted with dual-wheeled casters. Used for handling heavy parts in the prison garage, the hoist is made of heavy pipe and all joints are welded



↑ INDISPENSABLE machine tools of the Nebraska Penitentiary shop are a Prentice lathe, a drill press and a power saw. Most of the other machine tools have been built by inmates and are used in the prison work shop



MECHANICALLY MINDED PRISONERS at San Quentin are naturals for the prison machine shop. Considerable government machinery is repaired at San Quentin and Mr. Bailey, machine shop instructor, is shown at right supervising inmate machinists working on a lathe

bearings and the entire assembly is fastened to the boiler plate by studs and lock washers.

The auxiliary sickle grinder is mounted on another piece of boiler plate. The base is adjustable and demountable, swinging down out of the way when not in use. Two men, wearing protective goggles, can use the grinders simultaneously.

The furniture factory in this institution manufactures tables, desks, beds, benches, upholstered suites and other furnishings for the 16 Nebraska State Institutions, in addition to refinishing and reupholstering furniture. When the need for a saw gummer became acute, inmate machinists dug down into the salvage pile and came up with a machine which offers a speedy and highly successful means of gumming and sharpening saws from 3 in. to 3 ft. in diameter.

An old wood boring machine provided the base and a saw table which is raised and lowered within a 12-in. limit by a small handwheel. An old drill press table is locked in any one of hundreds of positions on the saw table by a heavy machine screw. An axe handle extension on the side lever provides movement of the saw table in a plane parallel to the grinding wheel.

The round arbor nut screws down upon a removable stud which can be located in either one of the two outside slots in the upper table. In operation, the saw blade is placed over the stud and the arbor is screwed down until the saw is held firmly but not so tight that it cannot be turned by hand to bring successive teeth against the grinder. The teeth rest against the small saw rest bolted in front of the grinding wheel.

After the saw is properly positioned on the table, the adjustable finger is moved so that it comes in contact with one of the teeth on the saw and is used to set the teeth in line with the grinding wheel. When proper set is obtained the finger is locked in position by the stud and automatically spaces the teeth when the saw is rotated. The finger is mounted on a curved arm which provides numerous positions of the finger in relation to the saw.

The depth of cut is determined by a long-handled stop screw. A wing nut was brazed to the end for ease in turning the screw. The end of the screw is fitted with a foot which strikes against the vertical portion of the base when the table is moved forward toward the grinding wheel.

When grinding or gumming, the operator merely pushes the saw forward bringing a tooth in contact with the wheel, draws the saw back, gives it a turn with his left hand and the adjusting finger automatically stops the saw at the next tooth.

Another strange-looking piece of machinery is a wood shaper made in the prison machine shop for the furniture factory. It was constructed from parts of an old dough-mixing machine and operates as efficiently as a factory-made job.

Thus, the shortage of equipment does not bother the prison machinist. He has evolved a philosophy which is as applicable "outside" as inside: "If we can't buy it—we'll make it!"

If there is a prison in your vicinity it might pay you to make a visit to the prison machine shop. Most Wardens are glad to show visitors around their institution. Your visit would be not only interesting—but probably productive of many ideas which could be used in your own shop, for the machinist who is faced with material and tool shortages can, with ability and inventiveness, produce inexpensive equipment.

Presses Hung on Rails

AT THE NEW Fisher Body parts plant at Hamilton, Ohio, large presses will not, as usual, be set on thick concrete bases. Fisher engineers believe that press transfers in plant rearrangement will be greatly eased by hanging the presses between steel rails jutting up from the floor below. From these rails, the machines will be lifted by overhead cranes.

The press pit, probably the largest in the world—800 ft. x 160 ft. x 20 ft.—is honeycombed with girders resting on reinforced-concrete columns built up from the 36-in. concrete floor. Long girders on the columns are criss-crossed by shorter girders that are spaced in pairs the width of the press they support. Projecting elbows near the press base rest on the girders. After presses are located on girders, 4-ft. sections of pecan-wood flooring are laid.

To utilize fully the advantages of girder installation, presses have been redesigned. Gearing has been moved from top of presses to the bottom, so it is under the floor. Lowered center of gravity adds to stability.

The idea of hanging presses on girder substructure is not new, having been used before the war. But the Hamilton plant is said to be the first complete embodiment of the steel network principle.

Shop Manual on Gage Usage Helps Inspector and Operator

BY WILLIAM P. WEHLAU AND D. THORBURN

USEFULNESS of an inspection department depends to a great extent on two factors: (1) the job knowledge possessed by individual inspectors and (2) how well the inspectors and operators work together. So the chief inspector should make it his business to find out what instruction is needed by new inspectors and what can be done to make older men more proficient and confident.

It has been observed frequently that a poorly trained inspector struggles along from day to day with a sad lack of confidence in what he is doing. Perhaps he leans for advice upon an operator who knows less than he does about reading drawings and proper usage of gages. Possibly the inspector indulges in arguments and draws in the operator's foreman—a bad practice.

More harmony in the shop and better level of efficiency can be achieved if the chief inspector takes the lead in seeing that his men (and operators too) get a good groundwork in proper handling of gages. The weekly conference system is good for talking over inspection problems and bringing forth sound gaging practice. Inspection foremen and group leaders should attend, and an invitation should be extended to the production supervisor or his representative, so the story can be carried to operators. And very likely it will be found desirable to develop a bulletin on proper gage usage, so inspectors and operators alike can benefit. The following points on gage usage were taken from a bulletin that resulted from a series of conferences like those suggested above.

Plug Gages

Before inspection, parts should be freed of chips, burrs and foreign matter because plug-gage tolerance is usually 10% of piece-part tolerance, and avoidance of undue wear is of paramount importance. Before use, apply a thin film of spindle

There will be less fumbling and fewer disagreements in the shop if the chief inspector sees to it that a good bulletin on proper use of gages is compiled

oil, or equivalent, to the plug gage. Align the bore and gage so their axes are parallel and coincide approximately before entry is made. No force is to be exerted; if the sharp edge of the gage has a tendency to snag in the bore, withdraw the gage and make a fresh start. When proper entry has been made and the plug has advanced about ¼ in., rotary motion up to one-half revolution—but no more—is permissible to complete the gaging operation.

When two gages, which have recently been checked, give contradictory results, it means that the part is so close to the extreme limit that it is encroaching on the gagemaker's tolerance. Needless to say, the part is acceptable and both gages are correct.

After use, the plug gage should be oiled, then put on a cloth pad or into a wood block or lined tray. Everyone should make it his business to see that plug gages are not laid on machine tables, placed on the bench with drills and reamers, or carried about in bundles of four or five. In other words, nicking, bruising and scratching of the gages should be avoided by care in handling.

Plain Ring Gages

In general, proper usage of ring gages follows the procedures recommended for plug gages. The ring and the work should be carefully aligned before contact. And under no circumstances should the ring gage be idly spun on the part. The go gage should fit the piece freely, the not go ring should be refused. Both go and not go gages should be oiled before use for inspecting parts, but should be used dry when used for setting air gages of the Precisionaire type. Distortion of ring gages occurs from temperature differences within them, thus leading to inaccurate results. It is important that the part and gage be at nearly the same temperature.

Air Gages

Air gages are normally used to check bore diameters to very close tolerances. The setting master rings are made to suit the high and low limits of the piece part. They should be used dry, and then oiled before storing.

Thread Plug Gages

To conserve thread plug gages, do not force them into the tapped hole or use them as burring tools. Check the size of the threaded part by engaging the first five threads or so with the go gage, then check the depth to which threads are usable from sample mating parts. This is good practice when the mating part

WHY OILING EXTENDS LIFE OF GAGES

Mr. Wehlau reports that a large shop found that oiling gages greatly prolongs their life, assists maintenance of close tolerances. The dry gages lost luster quickly and once the luster was gone, the size was soon lost. This happened on aluminum castings, said to contain microscopic particles that scratched the gages.

When inserted dry into close-fitting holes, gages pick up metallic particles. The plug bears against high spots in the hole. Friction causes the high spots to become intensely hot, so the small particles melt and attach themselves to the plug, it is explained.

If a visual gage will measure to two millionths, as claimed for this instrument, it is obvious that the inspector should be carefully trained in all pertinent details of its operation and care

is a screw of commercial quality.

In the general, the go gage should enter the hole freely, the not go member must not enter in excess of 1½ turns. Oil the gaging members frequency while in use.

Thread Ring Gages

More damage can be done to thread ring gages by a fumbling start than any other cause. Make sure that workpieces are clean and free of burrs before gaging. Oil the gage before using. The seal on the adjustment screw must never be tampered with.

Do not spin the go gage onto the part and never use a power-driven spindle to speed up the gaging operation. The not go gage may engage the part by 1½ turns.

Snap Gages

Commercial snap gages are used where the tolerance on the part is 0.002 in. and over; special snap gages for part tolerances of 0.0005 to 0.002 in. In no case use force to enter the piece between the gage anvils. This action produces inaccurate readings, because the gage frame is sprung to accomplish it, and wear of the anvil face is accelerated.

Flush Pin Gages

The simplest type of flush-pin gage has a step ground on the end of the pin, the pin bushing or the frame, the step height being the part tolerance. This type is used when part tolerance is 0.003 in. or more. Carefully wipe dirt from gaging surfaces and keep the pin well oiled.

Indicating flush pin gages are used when the part tolerance is 0.003 in. or less. The indicator is set with a master block, which should be treated as carefully as a gage block. Check the indicator frequently; when it shows a tendency to stick or acts erratically, return the gage to the crib for repair.

Hole Location Gages

Two types of hole location gages may be used: (1) with removable plugs, or (2) with stationary pins, as in straddle gages, where requirements are not stringent. The purpose of these gages is to check the relationship of a hole to a surface or relationship of two or more holes. Where gages have four or more plugs, it is good practice to engage only three at a time. Do not use force: if the part is correctly machined, the plugs will enter the holes freely. But to avoid trouble, first check each hole with plug gages. The pins in straddle gages are usually fragile, because the gages are often used to check groups of small holes. So handle such gages carefully to avoid unnecessary repair expense.

Dial Indicators

Uniformity of detail motions is required in gaging a piece with a dial indicator. Otherwise, the instrument is likely to give diverse readings if

10 Pointers for Inspectors and Operators

1. Know your job; a man can't have confidence in his findings if he lacks knowledge of processes and proper gage usage.
2. Make certain that you have the latest part print and process sheet.
3. Check to see that you have the specified gages.
4. Then be sure that you have read the print correctly.
5. In case of doubt, double-check your findings.
6. If checking from a surface plate, make certain that the setup is solid.
7. Treat all gages carefully, regardless of their type or cost.
8. Never tamper with or attempt to change gages.
9. Ok'd gages issued by the toolcrib are to be regarded as final, when a question arises because of findings secured with other methods.
10. Keep your temper; the other fellow may be right.

moved about on the work in various directions. As dirt and oil penetrate the mechanism, the action of the indicator will become erratic and unreliable. Do not force the stem back and forth in an effort to "free up" the indicator. Return it to the crib for cleaning. On models that employ a threaded button or point, be sure that this element is tightly seated on the stem at all times.

Master Disks

The setting of visual gages or comparators is often done with master disks. These are akin to gage blocks. Care must be used to avoid injury to these highly accurate gages; hence, in using them, the anvil and wear block of the visual gage should be cleaned carefully before the master disk is rolled under the measuring point. The disk should never be slid over the measuring surface of the gage.

Many inspectors do not need the knowledge required by a man capable of using a toolmaker's microscope, but all inspectors, and operators too, should be properly grounded on how to handle the gages entrusted to them

Gage Blocks

When not in use, gage blocks should be kept in the case and must have a thin film of white vaseline on the surface to protect them from corrosion. To remove the vaseline prior to use, wash the blocks in alcohol, carbon tetrachloride or trichlorethylene and wipe on a clean chamois. When wringing blocks, it is preferable to slide them on their longitudinal axes, after first wiping them on wrist or palm to pick up a small amount of skin oil to assist wringing. If the blocks persistently fail to wring, return them to the gage inspection department. Never attempt to remove a nick or other blemish; this is best left to the gage inspectors.

Micrometers

The micrometer caliper is effective for measurements to 0.001 in., and under certain conditions to 0.0001 in. However, the instrument must have anvil faces that are flat, parallel and square with the spindle axis, and the thread must not be worn. Withdraw the spindle from the frame as seldom as possible, and before doing so remove all nicks or burrs. Have the gage inspection department clean and adjust your micrometer at frequent intervals.

Optical Comparators

The accuracy of results obtained with optical comparators depends on several factors. In general, it is advisable to be certain that:

1. The adjustment of the condensing lens relative to the light source yields light rays that are parallel.

2. The relationship of the objective lens with the screen and the piece part being inspected should be such that a known magnification is obtained.

When there is doubt, check the magnification with a plug or pin of known dimensions and of a size comparable to that of the piece part.

Never attempt to clean a mirror in an optical comparator. Notify the gage inspection department when cleaning seems advisable. Exposed surfaces of lens may be cleaned with alcohol and a clean cotton swab, but refrain from dismantling the lens cells. Leadscrews and elevating screws should be kept well oiled, likewise table ways and other moving parts.

If charts are used to check parts, read the instructions and adhere rigidly to them. If the instructions are obscure, ask your superior for an explanation. Handle the charts carefully to avoid scratching the celluloid surfaces. Store the charts flat and put a sheet of paper between them.

Visual Comparators

With any comparator it is important to keep the anvil in first-class condition. When setting up, it is advisable to use a master disk when circular work is involved and a gage block if the part has a flat surface. By so doing, anvil flatness errors are minimized. Use a wear block on the anvil if possible, to save the surface of the anvil when production checking operations are involved.

Gage Handling Summarized

Inspectors and operators alike should realize that successful production of large quantities of parts to close limits is dependent on continued accuracy of gages. To all appearances, a gage may look sturdy and capable of abuse, but actually it is a delicate piece of apparatus, because of the fineness of finish applied to locating pads, gaging surfaces and other elements. Damage to these surfaces will eventually cause the gage to pass parts which should be rejected, or give rise to disagreements between a gage check and a check made on a surface plate.

Do not use a gage that behaves abnormally. Return it to the crib with an explanation of the behavior or trouble encountered.

Keep gages clean at all times and protect them from chips, grinding dust, coolant spray. Do not attempt to gage parts that are fouled in any manner.

Do not tamper with or attempt to make changes on gages. Stationary locating pins or gaging pins must not be driven out, rotated or disturbed in any manner. Sliding pins should be kept in their respective bushings.

Use no force when gaging. If the piece is machined correctly, no force will be necessary for the gaging members to fulfill their functions. No matter how solidly a gage is built, it is always possible to spring it or produce deflection by use of force, and the results secured are definitely inaccurate.

"Cradle-to-the-Grave" Tool Control

BY CARL G. RISING CHIEF ENGINEER, NATIONAL BLANK BOOK COMPANY

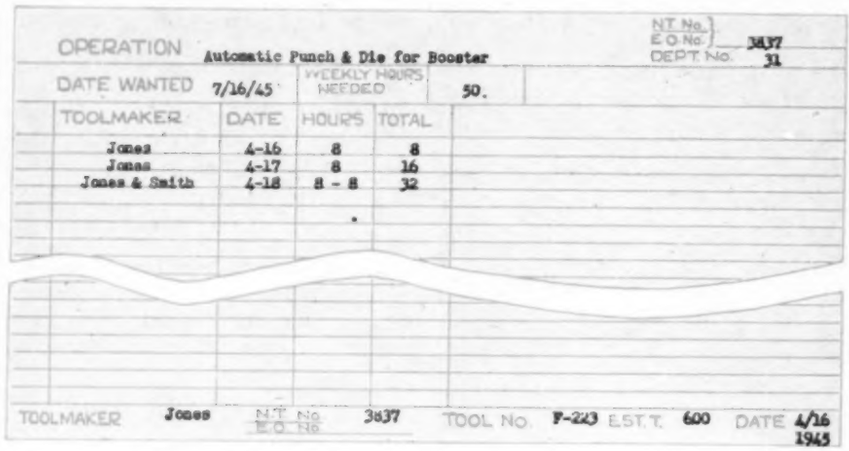
MUCH TIME and thought have been spent on control and expense of so-called "perishable" tools, such as drills, reamers and cutters. But permanent tools—dies, jigs and fixtures—have long been neglected.

Permanent tools are all too often sent into the shop, run until they break down, repaired in the toolroom and shot back into production. So at the end of the year, management knows that too many thousands of dollars were spent for repairs, but nothing much can be done, except to call the toolroom foreman "on the carpet" and tell him to cut down on expense.

Good records control production and repair of permanent tools, show when redesign is needed, can save 10% on repair bills and permit cost studies

Our company was no exception. We had no way of telling when we were spending too much on repairs, had no idea when dies were breaking too often and had plenty of trouble in meeting delivery dates on new tools. But with our new system, installed about a year ago, we now have "cradle-to-the-grave" control and record of every permanent tool built in our toolroom.

When tool drawings are completed, an estimate is made of the number of hours needed to build the tool and a time limit is set when the tool must be finished. This establishes the number of hours that must be worked each week on the tool to keep it on schedule. The records thus show the total number of hours of new work in the shop. Then if more time is needed to complete all new work on time and records show that not enough time is scheduled, it is at once apparent that work hours must immediately be increased or completion dates changed.



OPERATION: Automatic Punch & Die for Booster — NT No. / E.O. No. 3837 — DEPT. No. 31

DATE WANTED 7/16/45 — WEEKLY HOURS NEEDED 50.

TOOLMAKER	DATE	HOURS	TOTAL
Jones	4-16	8	8
Jones	4-17	8	16
Jones & Smith	4-18	8 - 8	32

TOOLMAKER Jones — NT No. / E.O. No. 3837 — TOOL NO. F-223 — E.S.T. 600 — DATE 4/16 1945

RECORD CARDS for Produc-trol board showing actual hours worked compared to weekly and over-all schedule focus attention on poor progress and need for extra work

OPERATION: Automatic Punch & Die for Booster — DEPT. 31

EST. HOURS 600 — ACT. HOURS 650 — MACHINES
COST LABOR $930.00 — COMPLETED 7/27/45 — SCRAPPED DATE
MATERIAL 25.00 — ACCEPTED BY J.S.M. — REASON
BURDEN 540.00 — SIGNED, DEPT. FOREMAN
TOTAL $1845.00 — SUPERINTENDENT

REV OR REDMK	REASON		REASON		REASON		REASON
TO TOOL ROOM	1/15		2/13		3/1		
COMPLETED	1/18		2/15		3/5		
HOURS	10		20		5		
REQ NO	3786		4015		6012		
PRODUCTION	10,000		5000		50,000		
	Broken piercing punch		Broken piercing punch		Grind die		

NT NO. / E.O. NO. 3837 — TOOL NO. F-223 — DATE 4/23/45

HISTORY CARDS of permanent tool giving dates, reasons and production between repairs show modification need for poorly designed tools

Visual Records Spot Trouble

The record cards showing needed and expended time are filed on a Produc-trol board hung in the toolroom, so immediate information is presented visually to focus attention on any critical items. A signal plug indicates the estimated number of hours needed to complete the job. The time clerk each day enters the hours worked for each job on its respective card and moves the cord to show the actual hours visually. Another signal plug is moved to show remaining hours needed to finish the tool.

Cord and plug should follow closely together to have the tool finished on the scheduled date. If the job is not progressing at the required rate, the foreman and superintendent can instantly spot it and take necessary action. The visual record also shows the toolmaker whether he is doing the job in the time allotted to him. Although no bonus is paid on tool work, the record helps to get the job done on schedule as a toolmaker, in most cases, likes to show that he can do better than the estimate.

When a new tool order is placed in the shop, a history card is started

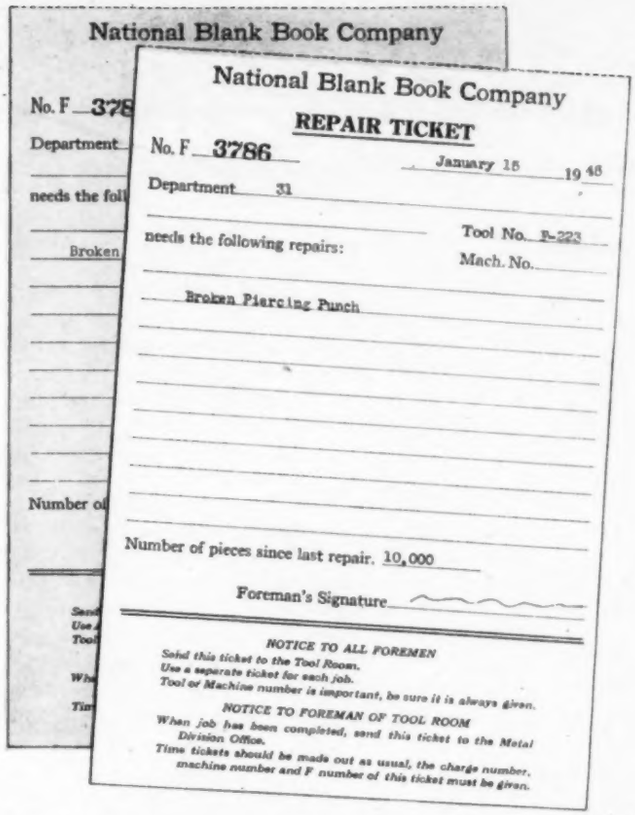
that will show time and cost to complete the tool, date of completion, any repairs during its lifetime, and date and reason for scrapping. When a tool is returned to the toolroom for repairs, the ticket accompanying the tool gives the number of pieces produced since the last repair and the reason for repair, such as a broken piercing punch or a dull die. The time clerk enters this information on the history card filed in the crib, as well as the date when the tool was brought to the toolroom, date of completion and time required.

The history cards are reviewed periodically by an engineering committee consisting of the chief engineer, toolroom foreman and maintenance superintendent. The clerk selects a number of cards every 2 weeks for review, especially those that indicate the tools need repair more often than necessary. Reason for review may not only be the same repair occurring at all times, but also the small amount of production obtained between repairs. In reviewing the tool, it may be found that the design is poor, the wrong kind of steel was used, the operator was not instructed fully on its use or any number of other causes might affect production.

After a careful study of the tool, the probable trouble is corrected. Further records show whether an improvement has been made and whether further modification may be necessary. But many times it is cheaper to scrap the tool and build a new one. We may be paying the price of a new tool on the installment plan in repairs, but still getting only an old tool because of its original poor design.

Tool life can be increased in many ways if the facts on what is really happening are known. But when the toolmaker must decide on repairs, invariably he rebuilds a tool exactly as it was before. This is no different from replacing a blown fuse without finding the cause.

Finding the cause and knowing when to redesign a die, jig or fixture depends on records accurately kept. The time spent in keeping the records up to date can be more than saved by keeping tools on machines and machines in production. With present cost of toolroom labor, it is more important than ever to keep it engaged on necessary new work rather than on periodical repairs.


National Blank Book Company

National Blank Book Company

REPAIR TICKET

No. F 3786 January 15 1946

Department 31

needs the following repairs: Tool No. B-223 Mach. No.

Broken Piercing Punch

Number of pieces since last repair. 10,000

Foreman's Signature

NOTICE TO ALL FOREMEN

Send this ticket to the Tool Room.
Use a separate ticket for each job.
Tool or Machine number is important, be sure it is always given.

NOTICE TO FOREMAN OF TOOL ROOM

When job has been completed, send this ticket to the Metal Division Office.
Time tickets should be made out as usual, the charge number, machine number and F number of this ticket must be given.

TOOL REPAIR TICKETS give production since last repair for entry on history cards to be reviewed by engineering committee

The combined savings in the first year of operation of this system are expected to be at least 10% of our repair work.

The same system can well be applied to machine maintenance. Facts may show that, because of excessive upkeep, it is profitable to scrap a particular machine. Even though a machine may appear in good condition, balancing its repair bills, down time, and production against those of a new machine soon show how quickly the latter can pay off—in savings and higher production.

Vauxhall Motors Makes Own Fuel Gas, Saves $50,000 a Year

BY FREDERICK R. BREWSTER
London Bureau, McGraw-Hill World News

To FREE its plant from dependence on public supply of heating gas, Vauxhall Motors in 1942 built three 100,000-cfh. producer-gas generators. Although installed primarily to remove its vulnerability in event of air attack on the public gas plant and distributing mains, Vauxhall realized an annual savings in fuel cost of approximately $50,000.

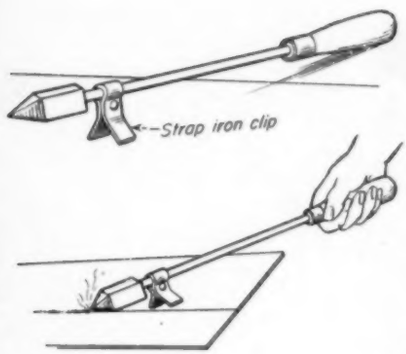
Equally valuable is the complete reliability of its gas supply and the flexibility resulting from generating to demand with no need for storage. This means a factory can be located irrespective of local gas-supply sources.

It was found that the Btu. content (150-190 per cu. ft.) could be controlled closely enough that heat of hardening, tempering, cyaniding and quenching furnaces could be maintained within plus or minus 2°. Among process heating operations successfully carried on by replacing high-Btu.-content gas were annealing axle-end welds at 525 C., carburizing rear-axle gears at 920 C., normalizing axle forgings at 990 C. and tool hardening at 1,400 C.

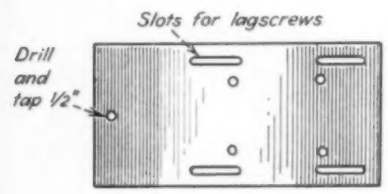
Utility heating operations carried on in the plant with the low-Btu.-content gas were melting Kirksite, drying molds, making shrink fits, heat-exchanger heating of air for drying ovens, brazing, soldering and preheating. Some modification of burners was necessary to adapt them to the low Btu. content. Soldering torches were also modified.

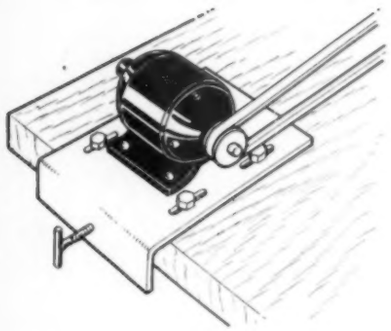
Short Cuts FOR THE SMALL SHOP

BY A. H. WAYCHOFF



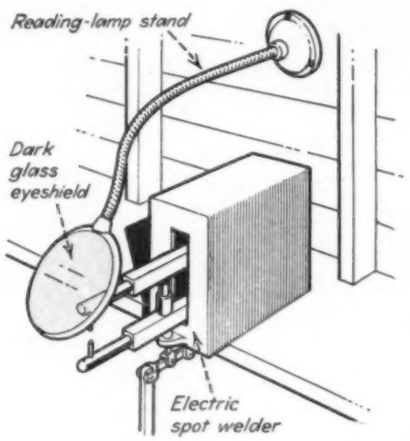
A CLIP REST on a soldering iron makes it possible to lay the tool down without danger of fire, and is an aid when working on long, flat seams. Make the clip from a piece of strap iron. The legs might be from 2 to 2½ in. long and be spread about 1½ in.



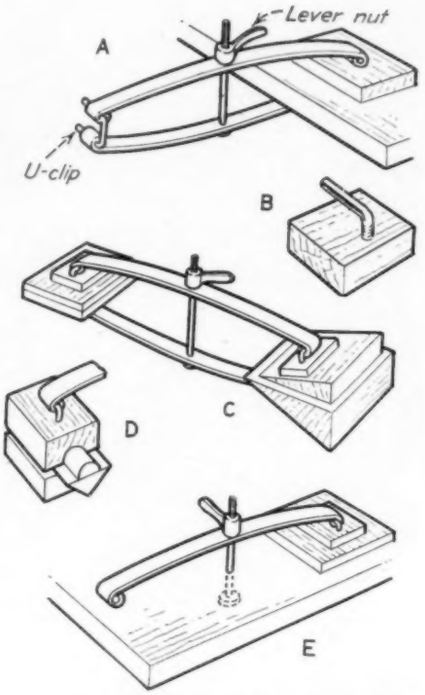


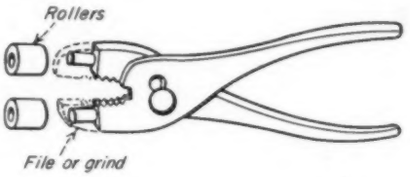
AN ADJUSTABLE BASE for small bench-mounted motors is easily made from a piece of iron plate a few inches longer than the motor base. Drill four holes for fastening the motor to the plate, cut four slotted holes for lagscrews to hold the base to the bench, and drill and tap a ½-in. hole at one end for an adjusting screw. Bend this end at right angles and make the setup as shown. The adjusting screw can be used to take up belt slack.

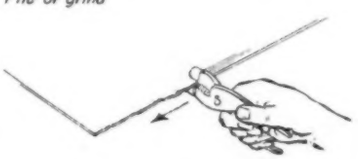
EYESHIELDS for bench-type spot-welders are essential where workers intermittently run to the machine for tackwelding purposes and forget to use goggles. In one shop where employees suffered from inflammation of the eyes because of this practice, the owner mounted the base of a reading lamp on the wall behind the bench, attached an old auto headlamp rim to the other end of the flexible tube, and fitted the rim with a piece of dark glass. The operator always looks through the glass, saves his eyes and is in no way bothered by the eyeshield.



HANDY CLAMPS for many uses about the shop can be made from automobile or truck spring leaves. In one application, as at *A*, pass a bolt through the center holes in the spring leaves and apply a lever nut. The u-clips should be made in various spreads between legs. Pads *P* can be held in the spring eyes, if the head of a lagscrew is cut off, bent to a right angle and screwed into the wood block. Then by use of pads at either end of a clamp, *C*, it is possible to hold two assemblies at once. Pads conform to the work contour. And special pads, as at *D*, can be made to hold various shapes together while gluing patterns, or V-blocks can be used for holding tubular products. For bench use of the clamp, as at *E*, drill a hole at a convenient point in the bench top and use large washers on the bolt. The forming of sheet metal, as at *F*, is another application of these clamps.







A HAND SMOOTHER for sheet metal that is cut with shears can be made from a cheap pair of slip-joint pliers. File or grind the jaws until they are transformed into pins about ½ in. long. A small steel roller about ½ in. in diameter is then slipped on each pin; and the ends of the pins are riveted over lightly. To use the tool, simply grip the roller jaws on the work and pull along the edge.

TALKING SHOP

Jet-propelled Pigeons

A CURVED aluminum tube, fitted from beak to tail feathers, discourages loafing on the wing among carrier pigeons. According to the "Beech Log," it catches the air and blows it at the bird's tail in flight, encouraging fast flying to keep warm. Some ingenious pigeoneer in the Signal Corps thought it up. Reminds us of Chic Sale's story of changing the seat cover of the golf-course privy from the brim of an old felt hat to sheet tin, thus discouraging a preempting and dilatory tramp. Even a pigeon doesn't like a chilly seat.

Progressive Painting

F. J. RILEY, plant manager for Liquid Carbonic Corp., Chicago, is repainting all plant equipment in colors. Machines will have dark green backgrounds, moving elements cream, electrical equipment light blue, operating levers yellow. Cranes and waste cans will also be yellow. Walls have a dark green dado, with light green above, and a white ceiling for light reflection. An innovation is painting gear guards red inside, so they show up when removed.

The welding plant has already been repainted. Mr. Riley reports worker reaction favorable and housekeeping considerably improved.

Ordnance—1200 A.D.

SEVEN HUNDRED YEARS AGO, a Papal envoy, Fra Carpini, visited Genghis Khan, the "Emperor of All Men." The Khan had made himself master of half the known world, and inspired Europe with a fear that lasted for generations. His realm covered the area from eastern Austria and Poland to China and from the Arctic Ocean to India.

Said the observant Fra on his return: "The princes of Christendom ought to have many soldiers armed with strong-bows, cross-bows and artillery which the Tartars dread. Besides these, there ought to be men armed with good iron maces or with axes having long handles. The steel arrow-heads should be tempered in the Tartar manner by being plunged, while hot, into water mixed with salt, that they may be better able to penetrate armor. Our men ought to have good helmets and armor of proof for themselves and horses. And those who are not so armed, ought to keep in the rear of those who are."

The Hub

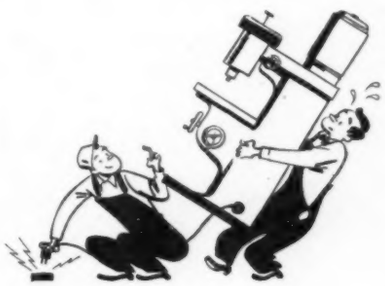
CROSS AND BUDD engineers have evolved a new truck hub. Hub, flange and outer race for the tapered roller bearings are made in one piece. Bearing races are heat-treated by the Budd internal high-frequency induction method. Then the hub is chucked in the new Cross machine and the two outer bearing races ground simultaneously, both being rough and finish-ground at one chucking.

Prohibition Repealed

CATERPILLAR TRACTOR is among those companies reinstating war-prohibited plant tours. In the last complete year during which such trips were permitted, Caterpillar had 19,662 visitors. It's still a first-class publicity idea.

Reconversion Feeder

FLEXIBLE electrical feeder systems, making relocation of equipment easy, prove an unexpected boon in reconversion. One large manufacturer found equipping a war-surplus plant immeasurably easier because the feeder system made equipment installation simply a plug-in job.



Timesaving?

AMERICANS have more time-saving devices and less time than any other people in the world. We are inclined to hurry at top speed to our objective, then sit down—or wait for the other fellow who takes his time.

No Standard?

IN PREPARING his special report on magnesium alloys, Associate Editor Ashburn discovered there were no standards for chemical finishes. He asked several people, "How come?" Result: The subject is now on the agenda of the American Magnesium Assn. Red-heads are born trouble makers.

Auto Sealer

PRESSTITE, the strip or liquid sealing material first used on refrigerators a couple of years ago, has now been adopted by Packard, Chevrolet, G. M. Truck, Briggs and Fisher Body. It is being used as an anti-rust coating in rocker boxes and under bodies and fender wells. An insert can be placed between parts to be spotwelded, doesn't affect the welding, yet seals the joint and prevents capillary action of water in the few-thousandths clearance. The sealer will go through Bonderizing, including caustic baths and baking up to 300 F without harm.

Have a Date

SOMETIMES you want a book for reference, sometimes for latest "dope." In the latter case, a text several years old becomes only an eagerly awaited disappointment. To end such uncertainty, McGraw-Hill Book Company shows in its 1946 catalog the year of publication or most-recent revision for each book.

Welding of the chassis-to-frame brace is completed under the hood over the slat conveyor, the hot piece falls onto a booster conveyor, at center, and the part is delivered by belt to the gondola in foreground. The booster conveyor is a portable, motorized type adjustable for inclination and elevation

FISHER BODY DEVISES AIDS FOR PRESSED-METAL HANDLING... 2

BY RUPERT LE GRAND
ASSOCIATE EDITOR

MATERIALS-HANDLING methods are under constant development by Fisher Body engineers. Their activities cover a broad front. Some phases of their work are: the removal of stampings from presses by mechanical means, as disclosed in a previous article; development of standard and specialized shop trucks and equipment useful in subassembly operations, and even assistance with making three-dimensional scale models in colored plastics when new plants are to be built. This article is mainly concerned with the results obtained when standardized shop trucks, skid boxes and dollies are used in subassembly operations. Applications pictured on these pages pertain to installations at Plant No. 1 in Flint.

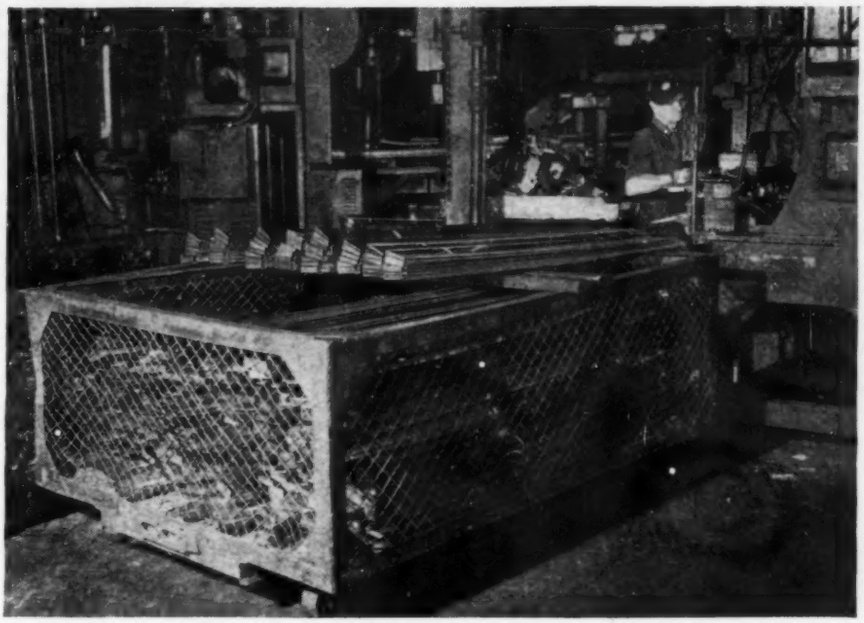
Gondolas (left) are lifted onto steel dollies with inclined top framework, so pieces are in convenient position for removal when the end gates are dropped. The operator loads right- and left-hand frame braces into the piercing press, then tosses the finished pieces into gondolas on the floor at either side of the machine

For Less Fatigue—Fisher Body believes in providing materials-handling aids in sub-assembly areas so that workers need not uselessly expend energy in merely picking up objects and laying them down. Three of examples of effort-savers are ap-

plied to two consecutive operations upon the dash-to-chassis frame brace. In these two consecutive operations, an operator finish-welds the two-part assembly as the tack-welded item passes him on a slat conveyor. As the assembly is hot, a disagreeable handling job is avoided by having the slat conveyor discharge to a motorized, belt-type booster conveyor. This device lifts the piece into a steel skid box, which is called a gondola, because it has an end gate.

The next operation involves piercing two holes in steps on the frame brace. It is not necessary for the operator to bend down and lift the brace out of the skid box because the gondola is put on top of a steel dolly with an inclined top retaining surface. When the end gate is opened, the pieces fall down onto it at correct height for removal by the press operator without stooping.

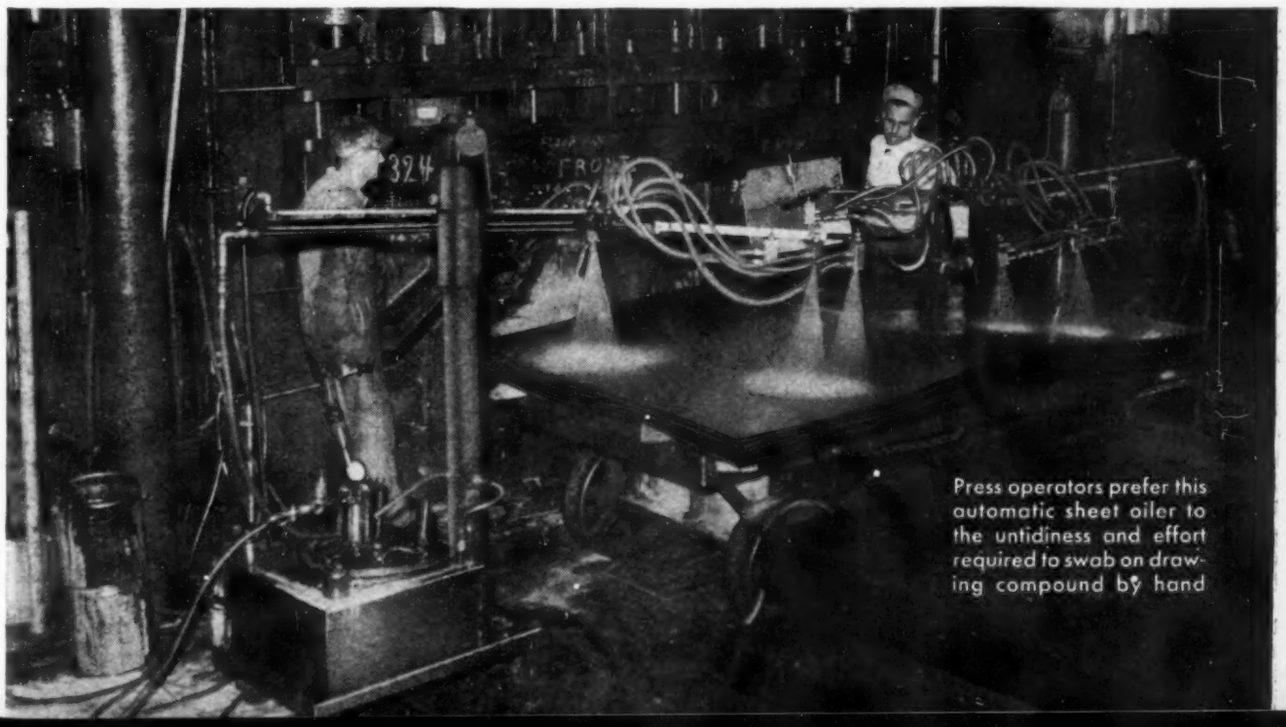
But right- and left-hand frame braces are required. So the press is fitted with two sets of dies, and gondolas containing rights and lefts are placed just behind the operator. To obtain a pair of braces, he turns slightly in one direction, then in the other direction, to grasp them. The braces are put into the dies simultaneously. After piercing, the operator uses both hands to remove the right- and left-hand pieces and casts them into gondolas placed on the floor at either side of the press.



Damage to partially fabricated stampings like reinforcing channels for the underbody is avoided by laying the pieces flat in an "LS" basket truck

Stock Trucks—To prevent damage to bulky stampings like underbody stiffening channels, the "LS" basket truck is widely used. These trucks are made in various lengths and widths. After blanking and perhaps flanging operations, the pieces are carefully laid flat in the truck and wheeled to the next fabricating operation. This may be the welding of a bracket or clip. Here the operator lays a couple of 2 x 4's across the basket, pulls a number of stampings out of the truck and stacks them on top of the 2 x 4's and one end of the truck, at convenient level for feeding into the machine. When he completes the assigned operation, the piece goes directly into a further sub-assembly process. For example, he feeds underbody channels into an automatic conveyor leading to the body welder.

Sheet Oiler—Installation of air-operated spraying devices has saved much time in applying drawing compound to sheets before deep drawing. These devices consist of a sump-type base that is filled with compound and has a column to support the spray arm. Air pressure applied to the closed sump forces compound through a filter and thence to piping to hoses at the spray heads. The arm and spray nozzles are adjustable so that the spray strikes the sheet area requiring lubrication. Now instead of laboriously swabbing the sheet and the general untidiness of such work, the press operators merely touch a valve or step on a treadle to apply compound at the desired location and in required quantity.



Press operators prefer this automatic sheet oiler to the untidiness and effort required to swab on drawing compound by hand

Interchangeability of Large Machine Parts

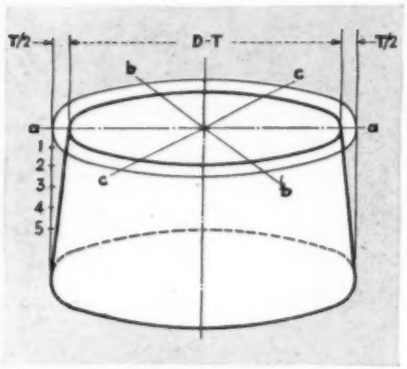


Fig. 1—Deviation from true shape is determined by measurements in three directions at five elevations

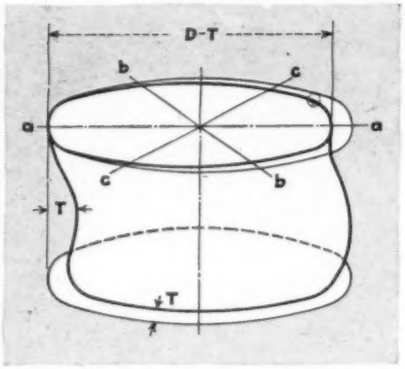


Fig. 2—Total tolerance *T* is indicated by the work deviating from the geometrical shape by curving of the axis

The need of interchangeability of large machine parts led to foreign research on diameters from 500 to 3,000 mm. Results are reported by the author, who was active in earlier ISA work

BY PROF. N. N. SAWIN

THE NEED for interchangeability of large machine parts of one meter or more in size was felt by the manufacturers of large equipment a long time before the war. A commission of the International Standard Association (ISA 3), composed of specialists of five countries using the metric system (Germany, France, Switzerland, Sweden and Czechoslovakia), established tolerances for diameters up to 500 mm. (about 20 in.)*

But, after achieving general approval for the ISA system of tolerances up to these dimensions, the ISA 3 commission decided not to give tolerances for larger diameters, because it lacked reliable, practical data on manufacturing and measuring errors on large products. The influence of elastic deformation and change of temperature during machining is incomparably more important for large products than for small ones. A further difficulty encountered is the lack of standardized instruments and appliances for accurate measuring in the shop.

Having been a close participant** in establishing the ISA 3 commission***, I made many attempts to determine deviations of the actual dimensions of large manufactured parts from their nominal sizes. But not until 1942-1944 did I succeed in instituting a wide research program on pieces manufactured either in individual or quantity production from 500 to 3,000 mm. (about 20 to 118 in.).

Measuring Conditions

In establishing the ISA system of tolerances up to 500 mm., all conditions of using fixed gages were taken into consideration. As a rule, in manufacturing large pieces, indicator measuring instruments are set up and checked by slip gages and micrometers. The indicator gives directly either the dimensions of the piece or the difference between the piece and the adjustable gage, but the accuracy of the measurements is affected by inaccuracies in manufacture and use of the instruments.

For sizes above 1,000 to 1,500 mm. it was necessary to construct new measuring instruments and study their reliability in comparison to known types of slip gages and micrometers for quantity production up to 500 mm. New wooden instruments, especially free from the influence of moisture and very light and solid, were of great help in establishing practically attainable tolerances in manufacturing large machine parts above 500 mm. The research was divided into two parts:

1. Investigation of tolerance-fields within 500 to 1,600 mm. on current products by the aid of current measuring instruments.
2. Investigation of tolerance-fields within 1,600 to 3,150 mm. by special insrtuments and new appliances.

Typical products, chosen for study, were made on machine tools of average quality, mostly on vertical lathes under normal manufacturing conditions, that is, with normally prescribed tolerances and by workmen not especially chosen and paid by the piece. The minimum tolerance, practically attainable, was determined by the test. The admissible deviations of accuracy were determined according to the grades of accuracy—ISA 5, 6, 7 and 8.

Determining Deviations

These deviations depend on: (1) the inaccuracy of dimensions resulting from the deviation from geometrical shape, (2) measuring errors and (3) errors resulting from the influence of temperature. The sum of these errors indicated the limit tolerance of manufacturing. If a special accuracy in comparison to the one normally prescribed was desired, a note "utmost accuracy" was made on the drawing.

Of 40 tested pieces, from 560 to 3,073 mm. in dia., several were of identical size. For instance, there were 9 light (135 kg.) pulleys, 1,254 mm. in dia. Identical also were 5 flywheels of average weight (700 kg.) 1,500 mm. in dia., 2 heavy (6,750 kg.) star-shaped wheels 2,740 mm. in dia. and 2 heavy (4,750 kg.) rings 2,738 mm. in dia.

The shafts and holes of identical nominal diameters of 560 and 1,125 mm. were machined simultaneously in different grades of accuracy 5, 6 and 7. The diameter of every piece of work was measured 15 times in a horizontal position before the work was taken from the machine tools, and again 15 times over the same points after its removal, the last measuring being repeated 2 or 3

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*Discussed in Vol. 78, p. 403 and Vol. 80, p. 616, American Machinist, by Dr. John Gaillard, A.S.A.

**Sawin, "Notes on Limit Systems," Engineering, March 30, 1928.

***Sawin, "Toleranzen Grosser Durchmesser." Werstattechnik 15, V, 1932.

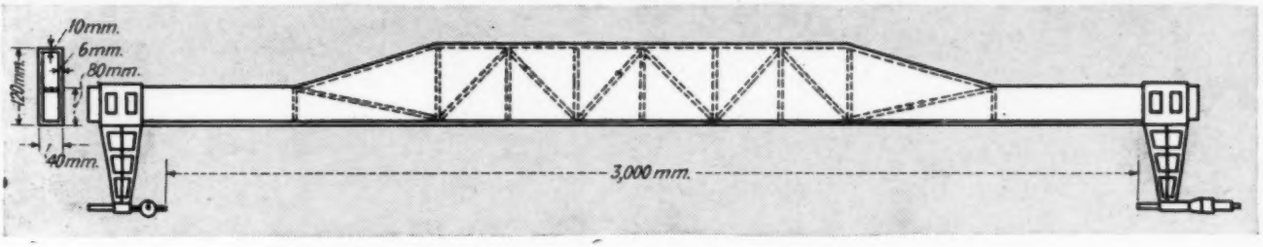

Fig. 3—Hollow plywood gages, developed by N. N. Sawin, are impregnated with paraffin or oil and wrapped with aluminum foil

times by different inspectors to obtain a reliable average result. Meanwhile, no less than one-half of all pieces up to 1,600 mm. were measured over the same points and direction in a vertical position. Thus, there were provided on every piece 30 to 90 measurements of the diameter outside the machine tools.

Comparison of the results of measuring in a horizontal position, on and off the machine tools, made it possible to determine the elastic modifications of shape that were a result of machining stresses and changes in temperature. Measurements in a vertical position showed the influence of deformations caused by the weight of the work.

All these data indicated how to set the measuring instrument during machining: (1) on the nominal measurement (the so-called "nought line"), (2) above it or (3) under it, so the dimensions of the work after its removal from the machine would not be outside the limits of the tolerance-field. For example, the final inspection of easily sprung belt pulleys indicated their dimensions were near to the nought line, that is, were accurate, when the instrument for measuring them on the machine was set on the low limit of tolerances, and with the heavy flywheels when it was set on the nought line.

As a rule, it is recommended that finishing, in particular cases, be done with the slightest possible tightening of the clamping bolts and not directly after roughing, and that the difference between the temperature of work and measuring instrument and the fundamental temperature 20°C. be taken into consideration.

Diameters of work machined on a vertical turning lathe were measured in a horizontal position in three directions *a*, *b*, *c*, Fig. 1, over five points along the height of the work. Measurements were made on the machine tools after finishing in clamped condition and outside the machine tools, two or three days after the removal of the work.

The maximum difference of three diameters served as a measure of "unroundness" in each of five cross-sections, and the maximum difference of diameters in all 15 measurements served as a measure of the maximum deviation from the roundness of the whole product. The maximum difference of diameters in one of three axial sections was taken as a measure of deviation from the cylindrical shape in axial direction, that is, conic shaped. The maximum value of unroundness and conicalness was taken as a measure of deviation from the cylindrical and conicalness.

It may be stated that the geometrical problem of a machined product is a space problem and that

TABLE I — Deviations from Geometrical Shape of 40 Tested Pieces (560 to 3073 mm. in Diameter)

Number of Pieces of Same Dia.	Number of Measurements Outside Machine	Diameter in mm.	Deviat. from Geom. Shape		Measurement Errors		Temperature Errors		Total Toler. of Pieces
			f_1 in μ at 20C	$\frac{f_1}{T}$	f_2 in $\pm\mu$	$\frac{f_2}{T}$	f_3 in $\pm\mu$	$\frac{f_3}{T}$	$T = f_1 + f_2 + f_3$ in μ
3	90	560	18	0.51	10	0.29	7	0.20	35
2	60	560	12	0.48	10	0.40	3	0.12	25
1	60	560	32	0.48	20	0.30	14	0.21	66
1	75	700	14	0.42	10	0.30	9	0.28	33
1	90	706	75	0.66	20	0.17	19	0.17	114
1	75	832	100	0.83	20	0.16	1	0.01	121
1	90	860	5	0.13	20	0.51	14	0.36	39
2	150	1,080	55	0.56	20	0.21	22	0.22	97
5	150	1,125	36	0.64	10	0.18	10	0.18	56
9	540	1,254	109	0.70	30	0.20	16	0.10	155
1	75	1,500	60	0.71	20	0.24	4	0.05	84
4	240	1,500	76	0.68	30	0.27	5	0.05	111
1	45	1,790	150	0.81	20	0.11	16	0.09	186
1	60	1,792	155	0.79	20	0.12	21	0.10	196
1	45	1,995	120	0.72	20	0.12	27	0.16	167
1	60	2,511	115	0.64	50	0.28	14	0.08	179
2	60	2,738	190	0.84	30	0.13	6	0.03	226
2	60	2,740	44	0.44	20	0.20	35	0.36	99
1	30	3,073	78	0.64	40	0.33	3	0.02	121
40	2,040	....		(av.) 0.62		(av.) 0.23		(av.) 0.15	....

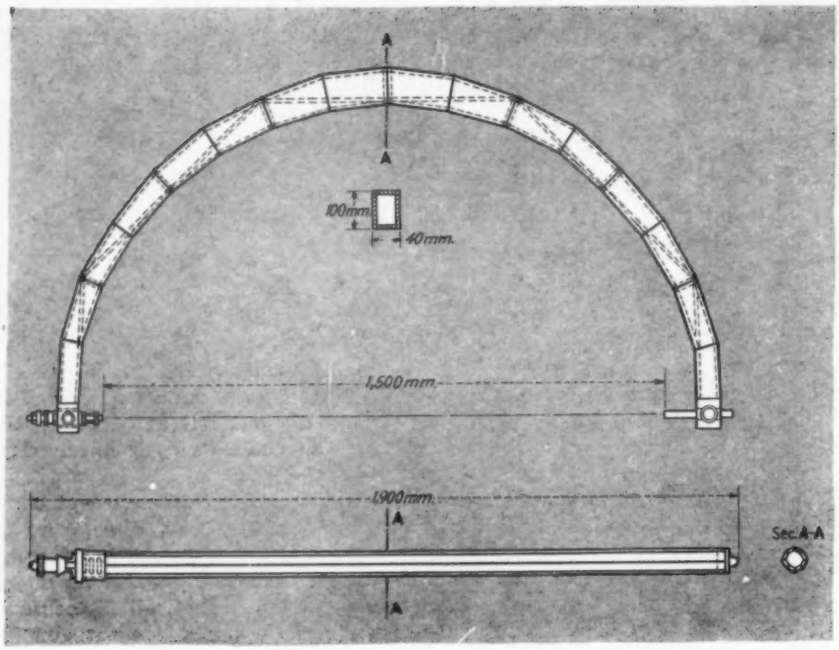

Fig. 4—Hollow plywood micrometers for diameters from 500 mm. are light, insensitive to temperature and change little in dimension in different positions

the individually measured diameters can be compared independently, one against another. Deviations may be a result of play between spindle and bearings of machine tools and the variable cutting forces. Also, the cutting edge of the tool may move at an angle to the axis of the work.

Other factors causing deviations from the geometrical shape of the product are the tension of the clamping bolts, the non-homogeneity of the material, the previous shape of the product, its elasticity and internal stresses, and finally the wear of the cutting tool. But all these factors seldom act simultaneously and in the same direction.

There is little possibility of getting a precise cylindrical shape of a large product on a vertical lathe. The actual shape usually lies between the rotating body with straight axis (Fig. 1) and the shape of a round or "unround" body with curving axis (Fig. 2).

The ISA rules for determining the curving of the axis of a cylindrical piece require measuring in many axial sections the distance between two parallel levels touching the piece. The maximum value of all values found will be the decisive measurement. This method requires much time and accuracy.

Large holes are measured by fixed or adjustable depth gages, while outside diameters are measured by hook gages or micrometer calipers. Fixed gages are not economical and are seldom used in manufacturing large parts in limited quantities.

For measuring outside diameters up to 2 m. on a vertical lathe, slide gages are applied, but their jaws, because of bending of the ruler, do not remain parallel and such gages are heavy. The Skoda Works lately manufactured their frames of thin plywood by a method I developed, as shown in Fig. 3. These frames are hollow, and are impregnated with paraffin or oil and wrapped to protect them from moisture, in thin (1/100-mm.) aluminum foil.

For measuring large diameters with the work in the lathe, micrometers are made with curved cast bodies. These are heavy and are sensitive to temperature changes, and results depend on whether measurements are made in the horizontal or vertical positions. Hollow wood micrometers, insulated by aluminum foil, are useful and suitable for measuring diameters from 500 to 1,500 mm. (Fig. 4).

They have the same shape as the metal micrometers, but in contrast to them, they are light, insensitive to temperature and, because of the solidity of their construction, change little in dimension in different positions. Workmen like to use them, and their accuracy, with correct treatment, secures interchangability of large pieces. For measuring large holes, wood depth gages (Fig. 4) offer similar advantages.

For checking measuring instruments for large diameters, parallel slip gages offer the best means. They may be taken as fundamental measuring, comparative, checking and work instruments. A rectangular slip gage with a cross-section of $9 \times 35 = 315$ mm.^{2} and a length L of 1 m., resting on two supports at the most advantageous points ($0.2213 \times L$ from their ends) keeps its measuring surfaces parallel, but its length is shortened by 0.2 μ where $\mu = 1/1000$ mm. The same shortening, practically of no importance, occurs also in a vertical position.

Some slip gages coupled together to a length of 3 m. are shortened in a horizontal position by 1.5 μ, and in a vertical position by 2 μ. Long slip gages made of tubes have the same accuracy as rectangular gages. When measuring great lengths on a precision measuring machine, errors of measurement may be:

Length — m.	500	1,000	2,000	3,000
Error — μ	2	3	6	9

When measuring identical lengths on common measuring appliances in the shop, the errors may be twice as much.

All work-measuring instruments must be adjusted on the slip or depth gages in the same position and with the same pressure as used in measuring the pieces of work. Deformations of instruments may be ignored when they are the same during adjustment as in measurement.

The difference in the grade of accuracy of measuring instruments shows in the following example: A steel wheel with a nominal diameter of 2,740 mm., after 10 measurements in a horizontal position made by different inspectors, had the following average deviations:

Sawin insulated wood hook gages	30 μ
Uninsulated wood hook gages	60 μ
Light hook gages, welded of 1-mm. thick plates	60 μ
Heavy hook gages, welded of 3-mm. thick plates	150 μ

The influence of temperature when measuring large pieces may be important. If the work, measuring instrument and adjustable gage have the same coefficient of expansion but different temperatures at different points along their lengths, every measurement will be inaccurate. For example, with an average coefficient of expansion of 11.5×10^{-6} for steel and with a difference in

temperature between the work and the measuring instrument of 3°C, the error at 1 m. will be equal to 34 μ and at a length of 3 m. to 103 μ. With different coefficients of expansion, the results will be still worse.

When comparing pieces of different materials, it is necessary to measure their temperature with an instrument such as a Zeiss body thermometer, the accuracy of which is ± 0.2°C. But the temperature of the outside surface of a piece is different from that of the inside, especially in massive pieces after machining. Therefore, it is necessary to wait until they return to room temperature. With small pieces, it may be necessary to wait one hour, for larger ones half a day, and for a piece, for instance, of 1,000 kg. two days.

Because of its small mass and relatively large outside surface, a measuring instrument assumes room temperature much quicker than the work. To count upon equalizing of the temperature of the piece and that of the measuring instrument is quite impossible. It is necessary, therefore, to consider the difference of their temperatures as equal to 3° in the shop and ½ to 1° in the checking room, with automatic regulation of heat up to 20°.

Dimensions of Tested Pieces and Fundamental Tolerances

Results of testing 40 pieces from 560 to 3,073 mm. in dia. are shown in Table I, with individual errors indicated as: f_2—inaccuracy of measurement and f_3—influence of temperature. The average total error f cannot be calculated by the Gauss formula on the basis of the law of probability, as the number of tests under the same conditions are not sufficient, often only one piece being tested. The average number of measurements, therefore, could not give correct average values. In such cases, either two-thirds of the sum of the principal errors or their total sum may be taken as the total error. For security, there was taken the total sum of errors: $f = f_1 + f_2 + f_3$.

The table shows (1) the nominal dimensions, (2) the number of identical pieces, (3) the number of measurements and (4) values of individual errors f_1, f_2, and f_3 with indication of their percentage ratio to the total error f. This last value was assumed as the tolerance practically attainable. Errors of geometrical shape, for individual pieces, varied between 13 and 84%, and for all pieces tested averaged 62%. Measuring errors varied from 10 to 40% and averaged 23%, and temperature errors varied from 1 to 36% and averaged 15%.

TABLE II — Fundamental Tolerances

Tolerance Grades		5	6	7	8	9	10	11	12
Value in Tolerance Units		7i	10i	16i	25i	40i	64i	100i	160i
Diameters in mm. From	To	Tolerances in μ							
315	400	28	40	64	97	160	260	400	640
400	500	32	45	72	110	180	290	450	720
500	630	36	50	80	125	200	320	500	800
630	800	40	56	90	140	220	360	560	900
800	1000	44	62	100	155	240	400	620	1000
1000	1250	48	68	110	170	270	440	680	1100
1250	1600	53	76	120	190	300	480	760	1200
1600	2000	59	85	135	210	340	540	850	1350
2000	2500	66	94	150	230	380	600	940	1500
2500	3150	73	105	170	260	420	680	1050	1700

On the basis of the investigations, it does not appear possible to maintain for large pieces the old ISA formula for the tolerance unit $i = 0.45\sqrt[3]{D} + 0.001\,D$. It is proposed that, for diameters above 500 mm. this formula be retained, but for safety to increase the coefficient from 0.45 to 0.55, changing the formula to $i = 0.55\sqrt[3]{D} + 0.001D$. The tests showed that the application of this formula for fundamental tolerances in manufacturing large pieces for tight or running fits secures their interchangeability.

Fundamental tolerances for the grades of accuracy, beginning from the sixth tolerance grade IT6, Table II, were obtained from the ISA rules by multiplying the tolerance unit i on the numbers of the geometrical decimal period by the factor $\sqrt[5]{10}$. The grades of diameters were calculated also by the ISA rules, as the decimal period of normal numbers with the factors $\sqrt[10]{10}$ and $\sqrt[20]{10}$.

From the ISA rules, the nominal limit dimensions of pieces manufactured with the aid of adjustable indicator measuring instruments may be considered as the limit dimensions admissible on the "go" and "not-go" sides. To avoid a dangerous transition of these limits, it is recommended that the measuring instrument for the "go" side be set at the value a inside of this nominal dimension, and the instrument for the "not-go" side at a_1 on the nominal "not-go" dimension. The insuring values a and a_1 are calculated from the formula

$$a = a_1 = 0.05\sqrt[3]{D}.$$

Other insuring values of the ISA system up to 500 mm. (for instance y for the limit of wear and z for new fixed gages in case when adjustable instruments are used) are not taken in consideration.

The mechanical fit of large pieces was investigated and checked on several examples:

1. On shafts and holes 560, 1,125 and 2,511 mm. in dia. for the running fit H6/m6 and for the transition fits H6/j6, H7/h6 and H7/j6 (ISA fit symbols).
2. On shafts and holes 1,792 and 2,740 mm. in dia. for press fits H8/t7, the machine parts mated in a heated state were steel rings and cast-iron and steel wheels for gear wheels of a large rolling mill.

All parts were manufactured by the rules of interchangeability, that is, machined independently of each other on different machines and by different workmen. In manufacturing, the Sawin wood measuring instrument, Zeiss-Schmalz apparatus for measuring the smoothness of fitting surfaces and a Zeiss body thermometer for measuring the temperature were used. Tolerances of fits were calculated by the ISA formula for identical fits up to 500 mm. in dia. Checking the properties of the fits and the interchangeability of large manufactured parts gave satisfactory results.

This discussion on the interchangeability of large machine parts is based on a project to extend the ISA system of tolerances. It is presented to arouse the interest of the American technical societies in the work of the ISA 3 committee, because now may be the proper time to create, in the interest of world commerce in machines, a unique *inch-millimeter system of tolerances.*

ROUND TABLE

Should Men Be Specialized?

"What do you think I just saw, Al—a specialist toolmaker on upsetter dies! He had the nerve to tell me he'd specialized just like the big doctors do and expected to get paid like they do, too—for knowing only part of his trade."

"Maybe he sounded funny to you, Ed, but a forge-shop foreman would give his eyeteeth for a fellow like that. Instead of knowing only part of his trade, as you say, I'll bet he knows the whole job of toolmaking and has specialized on top of that. There are a lot of little tricks in making upsetter dies right. Providing enough grip to keep the plunger from kicking the stock out is just one example."

"Oh, well, anybody who worked with dies like that would get onto the tricks in a hurry. There are tricks in every trade, most of 'em just common sense when you know your business."

"Meaning you don't know how to hold the stock in, but figure you could learn if you had to, eh? Well, that's what he did, I suppose, plus putting in a lot of time watching those dies in operation to find out what goes wrong with them and the machines, allowances for expansion, clearance for gas and scale, flash trimming, and variation in clearances, step by step, in a multi-step die."

"You begin to sound like a specialist yourself, Al. Where'd you get onto all that?"

"Oh, I worked around a forge shop for a couple of years while I was serving my time. We had toolmakers there that you might call specialists—they'd worked on forging dies all their lives."

"Yeah, and couldn't get a job anywhere else. Makes the company pretty sure of its help, doesn't it? They can pay just about what they please, unless the town is full of forge shops."

"That's where you're wrong, Ed. That was the only forge shop in town, but those fellows got more than the other toolmakers and diesinkers because of the money and time they could save. They got dies right the first time, or with one tryout; the other boys had to cut and try—and sometimes had to turn a job over to a specialist to get it working at all."

"They were just bum mechanics, Al, and you were too young to know 'em apart. I still say, the specialist is lucky if he gets extra dough."

"Those boys got it, Ed, and without any trouble. They could always walk out and get a standard job at standard rates. The company paid 'em extra to keep 'em on special work, and they did special work because they got special pay. It worked both ways."

"Bet it doesn't any more, with union contracts and all. Nowadays, I'll bet your specialists get paid just like anybody else."

"I wouldn't know about that, Ed—haven't been back there in years. But if the management is smart, they're still paying a little extra for the boy who knows what he's doing on dies."

"If they are, they don't have any other mechanics worth the name. The other boys will walkout—discrimination they call it these days."

IS SPECIALIZATION *worth while to man and company? Or is the "all-around" mechanic always the preferable employee? Have you known specialists? If so, how did they fare in comparison with others? Your answers will interest other readers. Discussions of earlier topics appear on later pages.*

"SALES TALKS" on the suggestion form can help promote the plan, stimulate employees to think and act, and maintain a flow of new ideas.

Make Your Suggestion Plan Work

Success in your plant suggestion program depends on watching the basic essentials. Check your own plan against these ideas

BY HERMAN W. SEINWERTH*

PRESIDENT, NATIONAL ASSOCIATION OF SUGGESTION SYSTEMS

EXPERIENCE and general practice indicate that certain basic essentials are indispensable to the ultimate success of a suggestion plan. Proper administration of a plan can be divided into the three *P's* for positive progress:

1. Policy
2. Procedure
3. Promotion

1. POLICY

Advantages of a suggestion program from the human-relations aspect are so broad that they cannot be developed fully here. One point, however, must always be borne in mind—a suggestion plan deals with people, and not with things. This simply means that however fine the policy setup may be, it must always be interpreted on the basis of each individual case. No two people are alike.

A number of policy features fall into the basic-essential classification. These are:

Organizational Setup: Lately there has been a trend toward placing the suggestion program under the personal jurisdiction of the president of the company or one of the top vice-presidents. Proponents claim that, by making the suggestion plan an arm of top management, greater acceptance for the plan is achieved in all divisions of the organization. In many installations, however, the suggestion program is a function of the personnnel department or an integral part of the production division where most suggestions originate. In each instance it is necessary to review the particular problems and needs of the individual company and organize the plan accordingly.

Who Will Direct the Plan?: A top-notch administrator is a "must." This person may be designated by varying titles, such as chairman of the suggestion committee, secretary of the committee, or director or manager of the plan. But, regardless of his title, he is the sparkplug who must activate the plan and keep it operating successfully.

It is highly desirable that the person selected for this position have wide general knowledge of suggestion plans, be able to meet people easily and have an investigative mind and a flare for promotion and publicity.

What is a Suggestion?: What will qualify as a suggestion should be carefully interpreted and identified. Some companies adopt a broad interpretation whereby most anything that the suggester desires to put on a suggestion blank as a constructive change qualifies as a suggestion. Other companies prohibit items that relate to routine maintenance and repair or that come within the normal job expectancy of each employee. Whatever the interpretation may be, all concerned should agree on the definition, which should then be made known to employees.

Eligibility: In practically all suggestion plans, non-supervisory and non-technical workers are considered eligible for awards for most of their ideas that are adopted. There is considerable difference of opinion as to the extent to which supervisors and technical men should participate in awards. Each company should set up its eligibility schedule, based upon its own organization and giving full consideration to the work expectancy of each individual position. Basically, the suggestion plan attempts to reward employees for contributions considered to be beyond normal expectation of the job.

Awards: For a successful program, the award schedule must be fair. The specific details of minimum and maximum awards and percentage of annual savings to be paid should be determined after considering the type of business, financial returns and other conditions of the particular company. Statistics taken from

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Suggestion Plan
There is always a better way!
YOUR IDEAS WILL HELP FIND IT
• Write your suggestion and send it to your local suggestion committee
SUGGESTION COMMITTEE:
DATE
I SUGGEST

SUGGESTION FORMS may be simple in design, providing space on one side for the suggestion and brief instructions on the reverse side to guide the employee

MAKE YOUR SUGGESTION PLAN WORK (continued)

the National Association of Suggestion System (NASS) surveys indicate that most companies pay a $5 minimum award, have no maximum award and pay 10% of the savings for the first year that the suggestion is in operation.

2. PROCEDURE

Once a fair, liberal and impartial policy is established, the next step is to organize for the actual operating procedure in handling the suggestion. In this connection, there are a number of basic essentials. Again, however, as in the case of developing the policy for the plan, handling must be adapted to a full realization that the plan deals with human beings.

Anonymity vs. Identification: Three basis methods of procedure are being followed at the present time in handling sugegstions. The first is complete anonymity where no signature or identification whatsoever appears on the suggestion form, and the entire investigation is handled by number. The second is the optional method where the employee has the option of signing his name or of leaving the form unsigned, in which case it is then handled as completely anonymous. The third is the full-identification plan wherein all employees must sign their suggestion.

Much can be said on the merits of each of the three methods. It is advisable, however, to give extremely careful consideration to this subject before making a decision for one's own plan. The basic advantage of the anonymous plan is that it does away with the possibility of any personality influence during the investigation. On the other hand, personal contacts with the suggesters during the investigation procedure are not normally possible unless the suggesters are asked to identify themselves and come in for an interview.

The basic advantages of the fully identified plan are that it permits frequent contacts with the suggester during the investigation period, ties in the immediate superior of the suggester and in normal handling provides a number of worthwhile contacts between employer and employee. This also results in a greater personal recognition for the suggester.

Information developed by NASS surveys indicates that during the past 4 yr. there has been a definite trend away from the completely anonymous system and toward some degree of identification.

Suggestion Committee: The committee is the heart of the suggestion plan. Appointments to the committee should be made with the objective of securing broad representation of interests and capable workers that can, and will, devote sufficient time to suggestion work to take care of the necessary details and responsibilities involved.

One decision that must be made is whether to include non-supervisory personnel on the committee. Again, there are many successful systems working on either basis. If labor representatives are included, usually the committee is a joint affair composed of half management and half labor representatives.

The committee should meet often, at least weekly, to review suggestions and recommend awards. Beyond these duties, it should be charged with the responsibility for developing suggestion-plan policy, promoting and publicizing the program and taking care of any other details incidental to successful administration.

Suggestion Boxes: The suggestion box has become practically indispensable. It is true that in companies that utilize suggestion boxes not all suggestions are forwarded through that means. But the boxes do serve as a constant reminder to think and suggest, and offer a convenient depository for suggestions. When combined with a receptacle for dispensing suggestion blanks and a suggestion poster board, the whole unit becomes an important promotional item for the plan. The suggestion box receptacle should be locked and serviced regularly to collect suggestions as well as to install new posters for publicity material and provide additional suggestion forms.

Suggestion Form: An accepted principle is that all suggestions must be submitted in writing. This protects the company as well as the suggester. It therefore follows that a convenient form should be designed for this purpose.

Some administrators feel that the form should be in considerable detail so the suggester will furnish a maximum of information concerning his idea and so simplify the investigation routine. Most administrators, however, feel that this method is undesirable, because it tends to discourage an employee from submitting his idea if he lacks the ability, or does not wish, to work out the problem in such detail. Most suggestion blanks are therefore simple forms, providing a space for the idea, name of the suggester, job, department, check number and date.

Frequently practice is to include some brief instructions relative to the submission of ideas on the reverse side of the form. The design

of the form as far as name, tearoff stubs, etc., will depend on the type of system adopted—anonymous or identified.

Office Routine: Adequate facilities must be established for proper acknowledging, indexing, investigating, closing out and filing of each suggestion. The particular forms and procedures may vary a great deal. The over-all objective is to handle the routine clerical work necessary in the most efficient manner and still fully allow for the human factors involved.

Investigation: The investigation can be handled by trained investigators, suggestion-committee members or by referring the files to interested supervisors. Most of these methods or a combination of them will work satisfactorily, the choice largely depending on the individual requirements of each company.

It is considered desirable to contact personally the suggester during the investigation so he can explain his idea more in detail and have a real part in the investigation. Keeping the immediate superior of each suggester fully informed encourages his participation in the over-all conduct and administration of the program. The key men in the suggestion program are foremen and department heads. Certainly nothing should be done which in any way has the effect of usurping their prerogatives. Keep them posted and make them an integral part of the setup.

Decisions involving the adoption of suggestions should be made by the same management representative that would ordinarily vote on such items if the idea had come from some source other than the suggestion plan. It is unwise to give the suggestion committee the authority to adopt or reject proposed methods. The committee should, however, review all decisions and have the authority to return a file for further consideration if it feels that an adequate review of all factors has not been given.

Committee members should, above all, be sure that the only reason for adopting any suggestion is its value or benefit to the company. No suggestions should be adopted and awards paid merely to soft-soap or salve the feelings of suggesters. This is poor policy in the long run—awards should be paid for value received. By operating on this basis, the plan will be better respected by employees. When decisions are fully approved, the suggester is entitled to a full and complete explanation in case his idea is not being adopted.

3. PROMOTION

The primary objective of a suggestion plan is to stimulate all employees to think and suggest improvements. To maintain a steady flow of new ideas from present suggesters and increase the flow as other employees are encouraged to think and suggest, requires a continuing publicity and promotional program. A suggestion program cannot force people to think, but it can, and must, frequently remind them to think. Bear in mind that the best advertisement for a suggestion plan is the busy voice of a satisfied suggester.

The promotional program of the suggestion plan is three-fold in nature:

1. Inform employees about the plan, how it works and how they should submit suggestions.
2. Stimulate their thinking by frequently reminding them to think.
3. Educate them to think up more and better ideas.

The promotional program should embrace not only continuing approaches and contacts, but varying ones in addition. Utilization of employee publications, bulletin boards, public award presentations, printed material, visual aids, contests and many other features of the plan itself provides a wide field of action in achieving this objective.

Many other details incidental to policy, procedure and promotion must be considered before the complete suggestion plan may be effectively administered.

Aluminum Shingles Produced on Tilted Presses

Southern States Iron Roofing Company is now getting ready to produce aluminum shingles in forest green, tile red and blue-black.

This will involve the use of special color finishes and special preparation of the metal. Production lines are now being set up for manufacture of painted shingles. The protective coating of oil will first be removed with an alkaline cleanser. After rinsing, the shingles will be dipped in a phosphoric acid solution which slightly etches the surface and leaves a light phosphate film coating on the surface. This treatment and coating is similar to bonderizing for steel. A special synthetic baked enamel is sprayed on as the shingles pass on a conveyor.

Standard presses, bolted to angle-iron supports anchored to the floor, are tilted to provide gravity unloading for flanging, crimping and trimming operations on the shingles.

AN ANALYSIS OF
Involute Sliding

BY BEN BLOOMFIELD
ENGINEER
THE FELLOWS GEAR SHAPER CO.

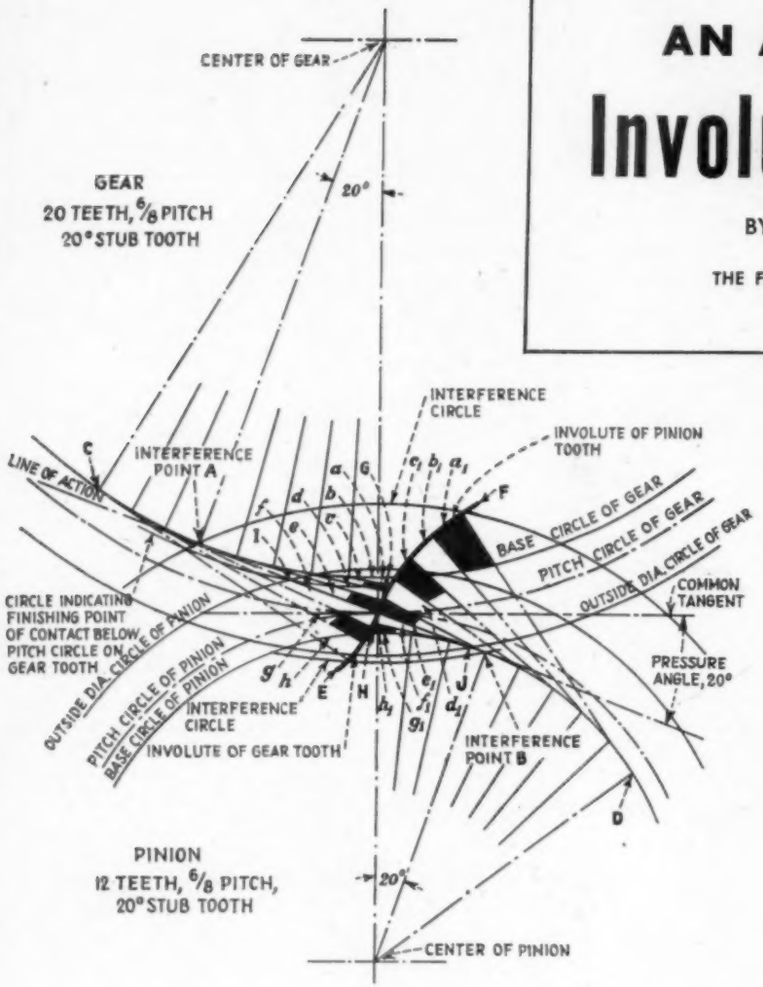


Fig. 1—Tooth action between an external gear and pinion of 20- and 12-tooth ratio, 20° pressure-angle stub teeth. Alternate shaded divisions of the involute curves of this diagram show those portions of each curve that are in contact with each other during an equal pitch-line movement of the gears. Corresponding mating surfaces are lettered, a, a_1, b, b_1, etc., on this diagram from the "The Internal Gear," published by The Fellows Gear Shaper Company

The true nature of involute sliding, from a mathematical viewpoint, has not been thoroughly explained. A multitude of confusing formulas have been advanced; but none of them will stand the test of mathematical analysis. I will attempt here a solution both simple and capable of proof.

A line *A* may be said to come into contact with another line *B* without sliding when the instantaneous length of contact of *A* is equal to the instantaneous length of contact of *B*. Conversely, when the instantaneous length of contact differ, then sliding, or slippage, of one member over the other may be said to exist.

Fig. 1 shows how various portions of involute gears slide over each other. The direction of this sliding (or its algebraic value) changes when the action passes from one side of the pitch point to the other—from addendum to dedendum.

When action occurs near the outside diameter of the pinion, then a large portion of the pinion profile, represented by a_1, Fig. 1, slides over a small portion of the gear profile, represented by *a*. The converse is true when action occurs near the outside diameter of the gear. From this may be concluded that at some point on the tooth profile, there is no involute sliding. This point is the pitch point, a fact which will be established later.

Our problem now is to find the rate of involute sliding at any point of contact of two mating involute gears. This may be defined thus:

$$S = 1 - \frac{ds_1}{ds_2}$$

when S = rate of sliding
ds_1 and ds_2 = instantaneous lengths of involutes of gears 1 and 2 at point of contact

This definition satisfies the conditions listed above, namely, that there is no sliding at some point (where $ds_1 = ds_2$) and the algebraic sign can be plus or minus.

Fig. 2 shows two mating involutes contacting at point *P*. If the radius L_1 to the point of contact of the pinion is given, it is necessary to find the radius L_2, or to define the point in some other way. First, the active pressure angle *B* and the active pitch radii, r_1 and r_2 are found:

(1) $\cos B = \dfrac{a_1 + a_2}{C}$

(2) $r_1 = \dfrac{a_1}{\cos B} = \dfrac{n_1 C}{n_1 + n_2}$,

where a_1 and a_2 are base radii, n_1 and n_2 respective numbers of teeth.

(3) $G_1 = tan\ arc\ cos\ \dfrac{a_1}{L_1}$

$G_2 = tan\ arc\ cos\ \dfrac{a_2}{L_2}$

The angles G_1 and G_2 are in radians and are called the "total angles of involute" to the points on the involute represented by the radii L_1 and L_2. Formula (3) may be derived from the definition of the involute. Let G_r represent the total angle of involute to the pitch point (radius r). Then:

$$G_r = tan\left(arc\ cos\ \frac{a_1}{r_1}\right) = tan\left(arc\ cos\ \frac{a_2}{r_2}\right)$$

But, $\cos B = \dfrac{a_1}{r_1} = \dfrac{a_2}{r_2}$

Therefore, $G_r = tan\ B$

If L_1 is given, and r_1 and *B* found from (1) and (2), G_2 may be determined thus:

$$G_r - G_2 = \frac{n_1}{n_2}(G_1 - G_r)$$

(4) $G_2 = G_r - \dfrac{n_1}{n_2}(G_1 - G_r)$

Proof of this formula can be deduced from the fact that the total angle of involute is equal to the angle of rotation, if the action is considered as beginning at the base circle. The angles of rotation of the two gears are in inverse proportion to the numbers of teeth and if calculations are started from the pitch point (where $G_1 = G_2 = G_r = tan\ B$), formula (4) becomes self-evident.

Let ΔS_1 and ΔS_2 represent small portions of the two involutes near the point of contact.

$\Delta S_1 = a_1 G_1\ \Delta G_1$ and
$\Delta S_2 = a_2 G_2\ \Delta G_2$

as $a_1 G_1$ and $a_2 G_2$ are the instantaneous radii of curvature of the involutes at the point of contact.

$$\frac{\Delta S_1}{\Delta S_2} = \frac{a_1 G_1 \Delta G_1}{a_2 G_2 \Delta G_2}$$

By applying the theory of limits:

$$\frac{ds_1}{ds_2} = \frac{a_1 G_1}{a_2 G_2} \times \frac{dG_1}{dG_2}$$

But $\frac{dG_1}{dG_2}$ = ratio of angular velocities $= \frac{n_2}{n_1} = \frac{a_2}{a_1}$

and by substitution,

$$\frac{ds_1}{ds_2} = \frac{a_1 G_1}{a_2 G_2} \times \frac{a_2}{a_1}$$

$$\frac{ds_1}{ds_2} = \frac{G_1}{G_2}$$

$$(5)\quad S = 1 - \frac{G_1}{G_2}$$

At the pitch point, $G_1 = G_2 = G_r$, and $S = 1 - 1 = 0$. When action occurs in the addendum of the pinion, $\frac{G_1}{G_2} > 1$. When action occurs in the addendum of the gear, $\frac{G_1}{G_2} < 1$.

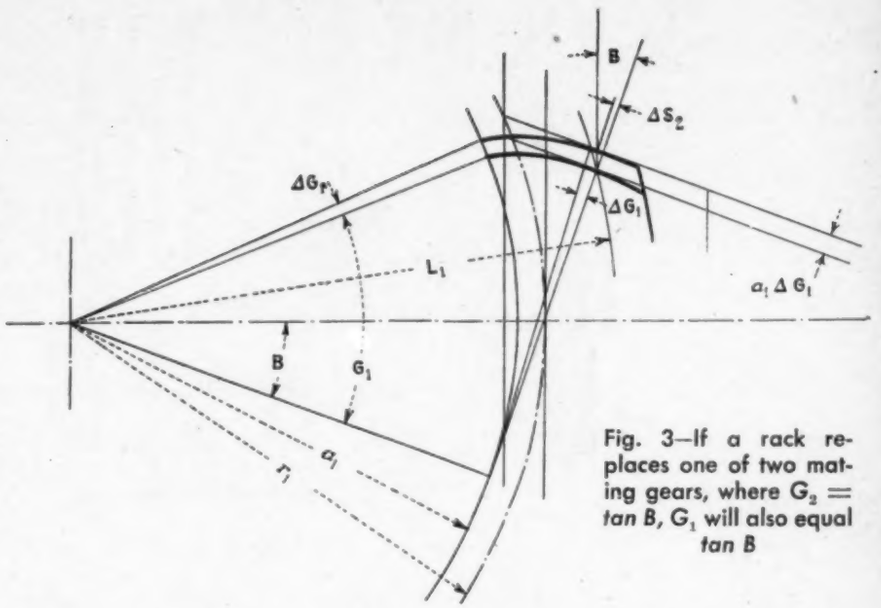


Fig. 3—If a rack replaces one of two mating gears, where $G_2 = tan\ B$, G_1 will also equal $tan\ B$

Thus this formula satisfies the conditions established in the definition of involute sliding.

If one of the two mating gears is a rack, for G_2 is substituted its value at the pitch point, where $G_2 = tan\ B$, and the formula becomes:

$$(6)\quad S = 1 - \frac{G_1}{tan\ B}$$

This last may be demonstrated independently by referring to Fig. 3.

$\Delta S_1 = a_1\ \ G_1 \Delta G_1$ (as before)
$\Delta S_2 = a_1 \Delta G_1\ tan\ B$

$$\frac{\Delta S_1}{\Delta S_2} = \frac{a_1 G_1 \Delta G_1}{a_1\ tan\ B\ \Delta G_1} = \frac{G_1}{tan\ B}$$

$$\therefore \frac{ds_1}{ds_2} = \frac{G_1}{tan\ B}$$

$$(6)\quad S = 1 - \frac{G_1}{tan\ B}$$

If equation (5) is analyzed, it will be found that when action takes place at the base circle of one of the mating gears, the rate of sliding becomes infinite. This merely states mathematically what every good gear designer has learned from experience—that involute contact near the base circle causes excessive wear which may result in scuffing or pitting. Higher active pressure angles, which tend to keep the action away from the base circle, and the use of enlarged and reduced combinations, or long and short addenda, will tend to reduce the amount of involute sliding at the extreme limits of contact of the mating gears, which is the point of maximum sliding.

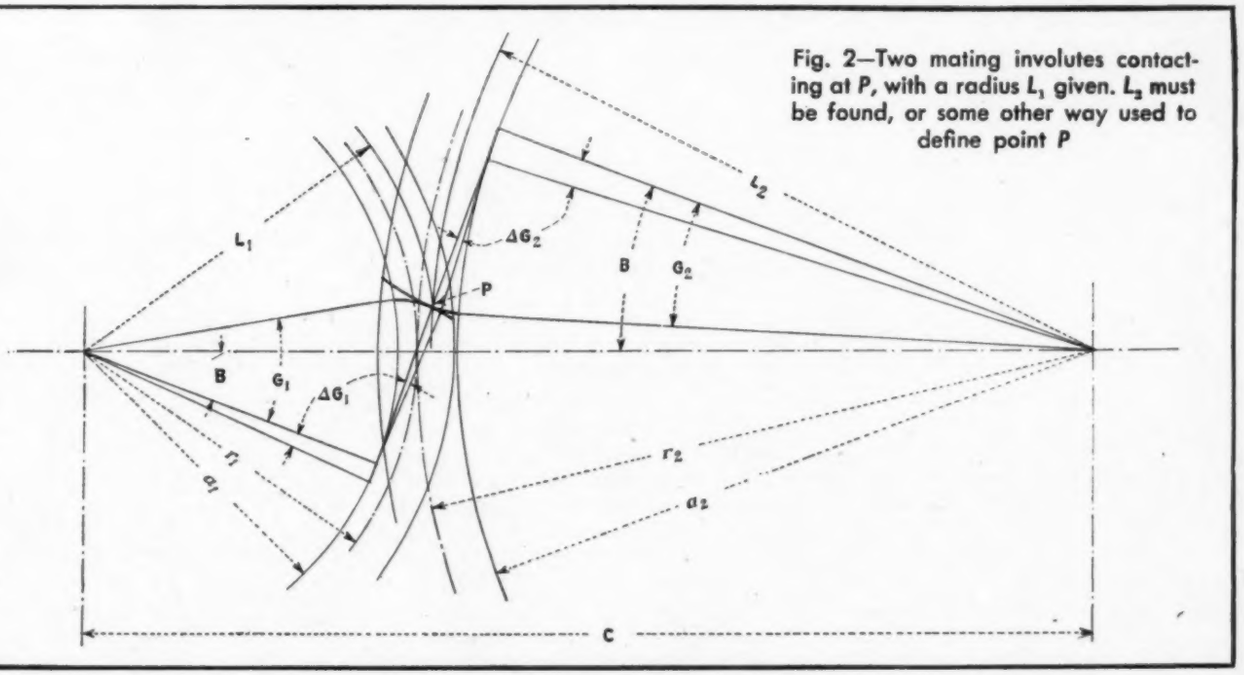


Fig. 2—Two mating involutes contacting at P, with a radius L_1 given. L_2 must be found, or some other way used to define point P

NEW ASPECTS OF JOB EVALUATION

BY RALPH MARTIN McGRATH

This thought-provoking challenge questions job specifications and confused terminology of present wage structures as inadequate to permit management to know just what it is buying

ALL JOB-EVALUATION system makers to date have repeated, apparently uncritically, the same error. This stems from the fact that the definition of job evaluation was made in terms of existing wage structures without critical inquiry as to whether the relationships shown by those wage structures were really sound.

Historically, we do not know enough about wage structures to assume anything like stability in them and the only sound basis that any evaluation can be tied to is the demand, stated in biological and sociological terms, that the job makes upon the normal individual who is to fill that job. When that is done, the services of the industrial psychologist and the physiologist, not to mention the industrial hygienist, will be sought instead of those of the cost accountant.

The traditional evaluation of positions or jobs was in terms of the unskilled to skilled baseline, but again that baseline was not critically examined. We do not know accurately today, for example, which jobs are predominantly physical in their demands, which jobs are predominantly skill or which jobs are primarily executive in character.

Until job evaluation does state its job specifications in terms of the demands that the job makes upon the normal individual who will fill it, using the accepted terminology of biology and sociology rather than the somewhat confused terminology of present wage structures, there is little chance that management will be in a position to know exactly what it is buying: skill, effort or responsibility. We have, for instance, always assumed that physical labor was cheap and that mental ability was dear.

All systems of job evaluation to date have been based on the assumption that the relationships of one job to another, as reflected by the wage structures that each assumed were correct, were the true relationships. This, I submit, there is much evidence to support is not true. We are witnessing today the premium that we are compelled to pay for services once regarded as unskilled.

Not until job analyses are made in terms of the demands of the job upon the normal individual, stated in biological terms, can we hope to see what is being bought and what is being sold in the labor market. Job evaluation based upon these foundations is a form of fact-finding that neither management nor labor can afford not to use.

What is paid for skill, for effort, and for responsibility is a matter of negotiation and will change with the factors of supply and demand. At the present moment, physical effort is in short supply, with the result that jobs that demand large amounts of physical effort are commanding premium wages.

To any student of the psychology of value, it must be evident that psychological factors influence "value." Now, as a result of the speed-up in training that was given in short courses during the war, there is a feeling that many people possess greater degrees of skill than peace-time standards will permit. It seems reasonable to state that as the labor market readjusts itself, this over-value of semi-skill will correct itself also.

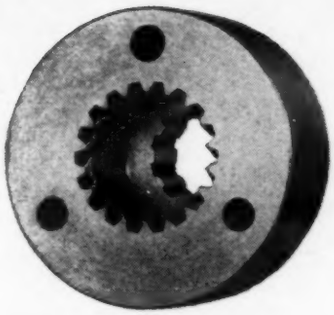
Job evaluation must, therefore, divorce itself as much as possible from prevailing wage structures, and its ablest statisticians must join hands with the industrial psychologists to find the objective measurements that can be adopted for the guidance of the engineers. No longer can the "guesstimate" of the engineer pass for expert opinion. There is no need for "guesstimate" and there is every reason why it should not be used.

In none of the publications to date is the close link between "working conditions" and physical and mental demand fully appreciated and yet, working conditions are the additional amounts of effort that the biological organism must exert to carry on the mental and physical demands of the job owing to the presence of the disagreeable elements. This seems not to have been grasped by any of the system makers and I am sure that I did not see it until I studied the work of Lawshe and Riegel statistically.

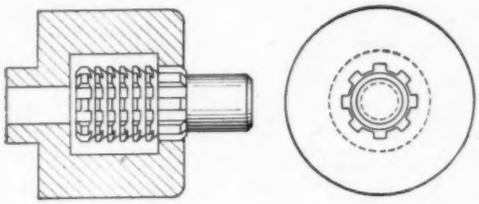
I am frankly amazed that men who are advising management did not see the industrial dynamite that exists in the publication of evaluations of "working conditions" and so-called "Unavoidable Hazards" without having ready to back that statement of evaluation the most careful set of physiological measurements that could be mustered. It is inconceivable to me that management does not have this data on file, but if it has, it has been too careful for its own safe position in husbanding it.

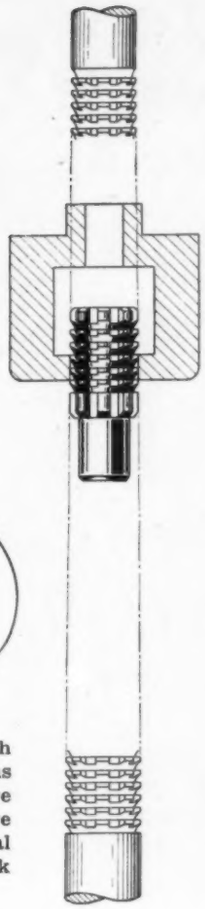
The crying need at this time is for standards in the entire field of physical demand, for standards in these disagreeable elements in working conditions, for clear-cut definitions as to when hazards actually exist and for training standards that are standards and not "guesstimates."

We laugh at the sacred cows of India, but job evaluation has a few sacred cows of its own that are impeding its progress fully as much as the sacred cows of India appear to us to be impeding its progress.

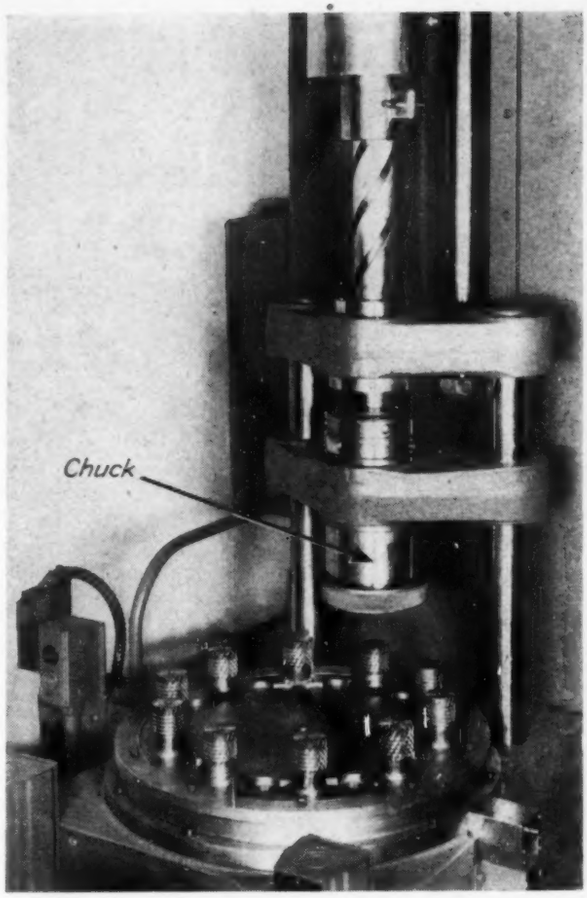


Clearance for the short sectional broaches is obtained by recessing the part below the section where the helical splines are cut





Above—Method of broaching blind hole with sectional broaches. *Center*—Broach sections equivalent in length to a 12-in. tool are needed. *Right*—The ten broach sections are locked in an indexing table; the helical splines are cut by lead bar control of chuck



Blind Holes Splined with Short-Section Broaches

BY HARRY H. GOTBERG, CHIEF ENGINEER, COLONIAL BROACH COMPANY

AT FIRST GLANCE it may seem impossible to broach a blind hole, because there is insufficient room on the tool for enough teeth to complete the cutting job. But there is a way of solving this problem. What it amounts to is this:

1. Design the broach in sections. As far as the cutting teeth of these sections are concerned, the sections when put together constitute a "normal" full-length broach. In other words, the sections are successive parts of a long broach.

2. For a high production setup, mount the broaches on an indexing table, and push the part over them in succession.

Details of the application of these principles to a transmission part are as follows: Helical splines are to be cut in the blind hole. Use of broaching with its advantages of precision and high output is made possible by recessing the blind hole below the section where the helical splines are to be cut. Normally, a broach with a 12-in. cutting length is required for this job. Ten short broaches, each with five sets of cutting teeth, should be used. These broaches are mounted on the indexing table, which is hydraulically operated, while the part is held in the moving ram head. The ram head is equipped with a master lead bar that is actuated by ram movement.

The machine cycle is automatic. After the operator loads a piece in the ram head and pushes a button, the ram pushes the part over the first broach, returns and stops. Now, the table indexes the second broach into position under the ram and the cycle of ram movement repeats. This continues until all broaches have been presented to the part, and then the machine stops for reloading.

If only a round hole were involved, broach tracking would not be important. But in cutting helical splines, the piece must be stripped off the broach and the next broach must cut in the path of its predecessor. Hence a key slot is cut in the broach shank for locating purposes. By this means, proper tracking of the several broaches is achieved.

For a setup like this, it is essential to build the machine and its indexing table, so that the latter moves to a specific position, stops and is locked in required alignment with the work chuck.

V-grooves Coined at Helix Angle in Thread Gages

By CHESTER RICKER
DETROIT EDITOR

UNUSUAL DESIGN FEATURES of the Woodworth adjustable thread ring gages are responsible for some special procedures in their manufacture. The design and operation of these gages was described in a previous issue.

The steel gage insert and the aluminum body both have holes placed eccentrically to act like a constant-pressure piston ring to keep the gage round when adjusted.

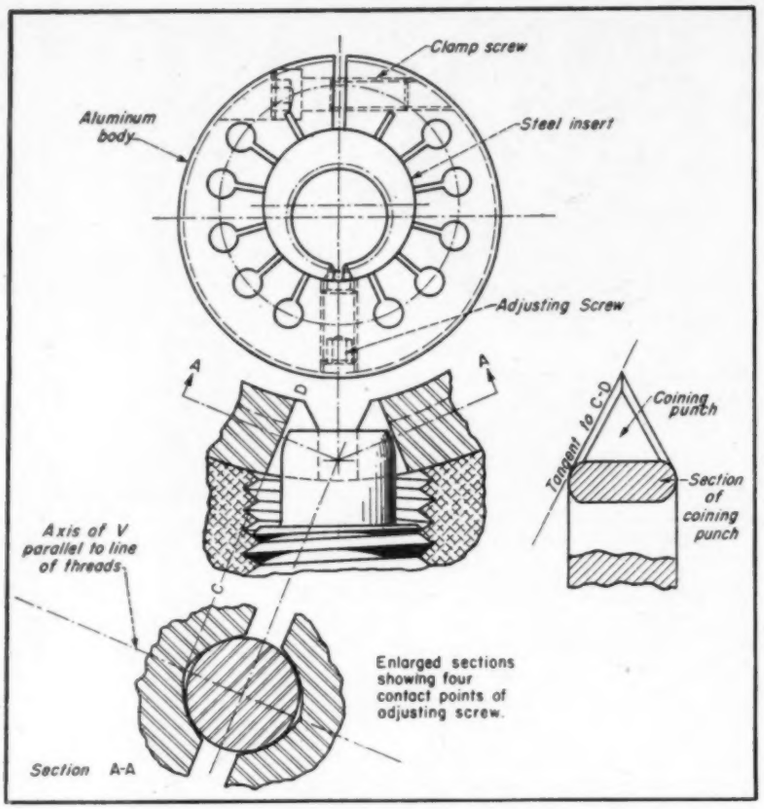
Adjustment is by a ball-pointed setscrew that engages V-grooves in the slot of the insert. Because the adjustment is made in the line of the helix to avoid offset of the threads, these grooves must be accurately formed. The extent of the variation is indicated by the following examples:

Dia.	*Threads per in.*	*Type*	*Helix angle*
0.25	20	NC	4° 11′
0.25	28	NF	2° 52′
1.00	8	NC	2° 29′
1.00	14	NF	1° 22′
3.00	3.5	NC	1° 51′
3.00	8	NF	0° 47′

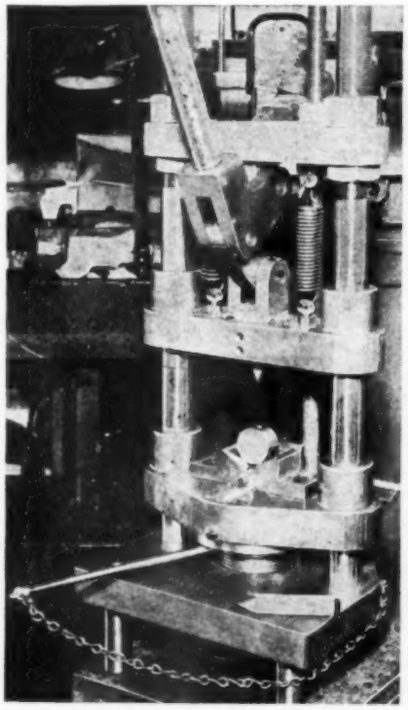
The insert is drilled and rough reamed for the adjustment hole. Then a special toggle action coining press and a series of punches produce the grooves to align with the helix angle. The insert blank is supported in a V-block mounted on a table with micrometer height adjustment. A pointed punch of suitable size is carried in the press.

The V-block support is then rotated to correspond with the helix angle of the gage and the V-grooves are coined. After the gage hole is drilled off center and tapped, the insert is heat-treated. Finally the blank is slotted with a rubber wheel and the threads are finished with a cast-iron plug lap.

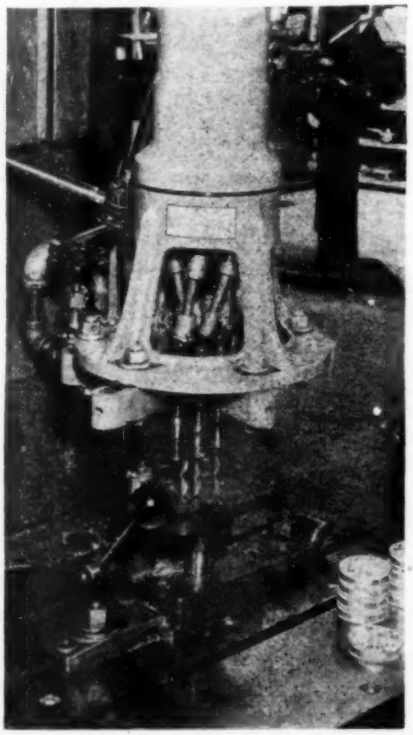
The aluminum body is drilled with a series of holes to reduce the weight and is anodized and dyed red or green for "no go" and "go" gages.



To secure offset of the threads, as the gage is adjusted, the axis of the V-grooves is parallel to the line of the threads



Inserts fit in the V-block on this toggle-action coining press for coining the V-grooves. The block has micrometer height adjustment and angular rotation to accommodate the various sizes produced



Weight-reducing holes in the aluminum body are too close together for centers of the drills. Every other hole is drilled from one side and the work turned over to drill the remainder so one jig and fixture serve for each size

Practical Ideas

Direct-Reading Straightedge Tester Uses Three Toolmakers' Buttons

S. FRAMURZ
Bombay, India

With two fixed buttons and one moving button directly connected to a dial indicator, all our squares and straightedges now are tested quickly with any error reading directly in ten thousandths of an inch over a semi-fixed base distance.

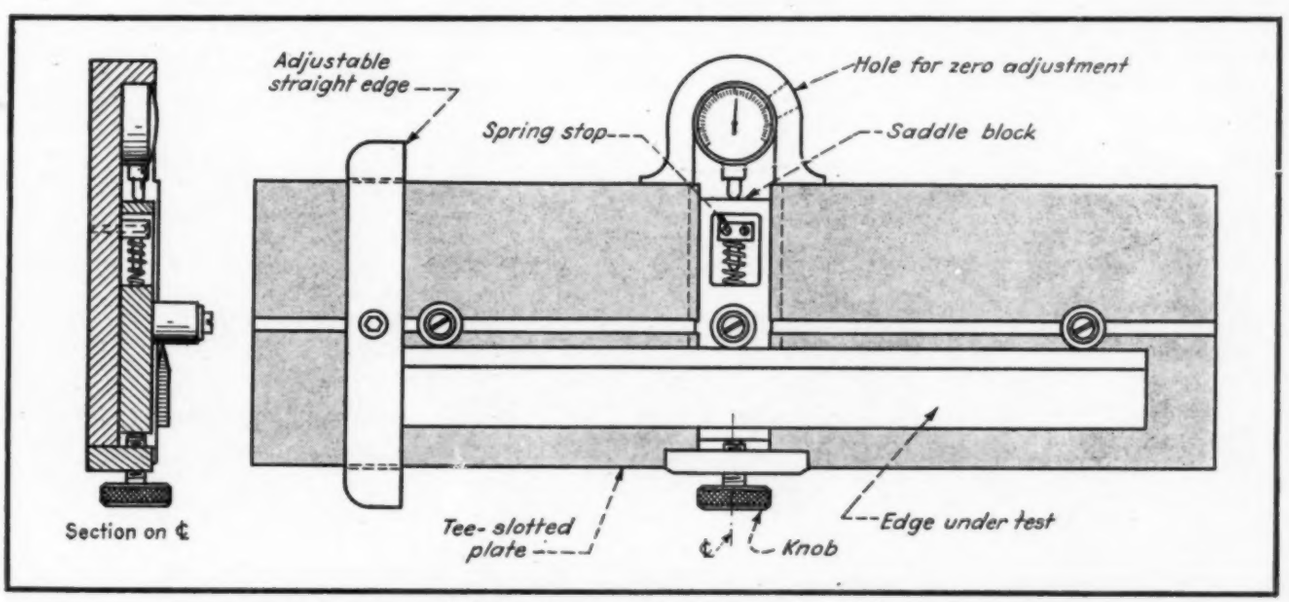
A square can be tested on its inside or outside with equal ease and an edge can be checked anywhere along its length. Adjustments can be made in a trice to suit varying lengths of edges or sizes of squares. Although the device is capable of great precision, it does not call for exacting accuracy in its construction since its accuracy is chiefly derived from a straightedge and three disks or buttons of any identical diameter, which should be readily available in any tool room.

The fixture consists of a tee-slotted plate with a dovetail groove at right angles to the tee-slot. A saddle block is made a good sliding fit in this groove and carries a button permanently fixed to it. The movement of the saddle block is controlled, in one direction, by a knurled knob and, in another direction, by a compression spring held against a spring stop, the latter being fixed to the tee-slotted plate with screws. The upper face of the saddle-block bears against a dial indicator which is so adjusted that it registers the slightest movement, either up or down, of the saddle block (and hence of the button fixed to it). Two more buttons adjustable in the tee-slot, and a straightedge, also adjustable along the tee-slot, complete the fixture.

To test an edge, the outer buttons, and straightedge, are adjusted to suit, and then locked with their respective screws. The edge under test is then applied to the two outer buttons, one end being held against the straightedge, as in the figure. The center button is then made to touch the edge by manipulating the knob and the indicator is set to zero. Next the edge is flipped over, its end held against the straightedge and contact established with all three buttons, the knob being reset for this purpose. The indicator will directly show the actual error. (It is necessary to hold one end of the edge under test against the straightedge; this ensures that the same three points on the edge make contact on either side of the three buttons for consistent readings.)

A square is tested in much the same way, except that only two buttons are used. The beam of the square is held against the straightedge and the blade against the nearest button. The knob is then adjusted to bring the second button in contact with the blade and the indicator is set to zero. The square is then flipped over and same conditions established by resetting the knob. Here again the indicator will show double the actual error, which is readily converted into angular error by measuring the center distance of the buttons.

Of course, it is not imperative to set the dial to zero. Instead, its read-



Center button and saddle slide transversely and move indicator plunger. The adjustable straightedge head provides means for testing squares

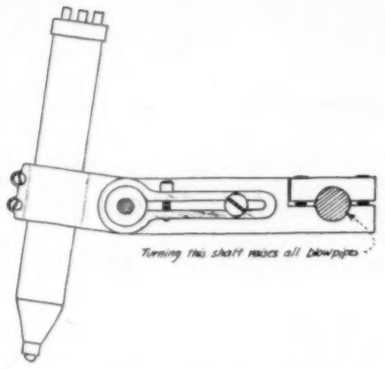
ing may be noted when the square or edge is first on one side of the buttons and then again when it is contacting them on the other side. The actual error is then half the difference between the two indicator readings; thus if the readings are plus 0.0006 in. and minus 0.0004 in., the error is 0.0005 in.

An interesting feature of the device is that it can be pre-set to serve as a 90° gage or master-square. Moreover, paradoxical as it may sound, such pre-setting can be done with an inaccurate square! To illustrate, let any square be tested as outlined above. Suppose that the double error shown by the indicator is 0.0008 in. Bring the indicator to read 0.0004 in. by manipulating the knob and then, without touching the latter, set the pointer to zero by means of the zero-adjustment of the indicator. This would set the fixture to 90° precisely. The advantage of such a setting is that a square can now be tested at a single reading of the indicator, that reading being the actual error (not double error now); the need of flipping the square over and taking a second reading is obviated. In other words, the test is reduced to the simplest and quickest form possible.

Tighter Grip Improves Pivoted Joints

G. L. LANDRY
Milwaukee, Wisconsin

In building a torch pipe-cutting machine, to replace the old sawing method, we were confronted with



several problems. Our machine was designed with a carriage having three blowpipes mounted on it, for cutting up a length of pipe into short pieces, three at a time. In order to simplify the loading, the shaft which held the arms and blowpipes in position was raised by a single lever, to give ample space to place the pipe to be cut, without danger of hitting the blowpipes.

After the new pipe was placed, the blowpipe arms were lowered to their cutting position. But in lowering the arms, abruptly hitting the stop, inertia tended to shake the individual torch pivots out of position, sometimes even to bang the tip against the work.

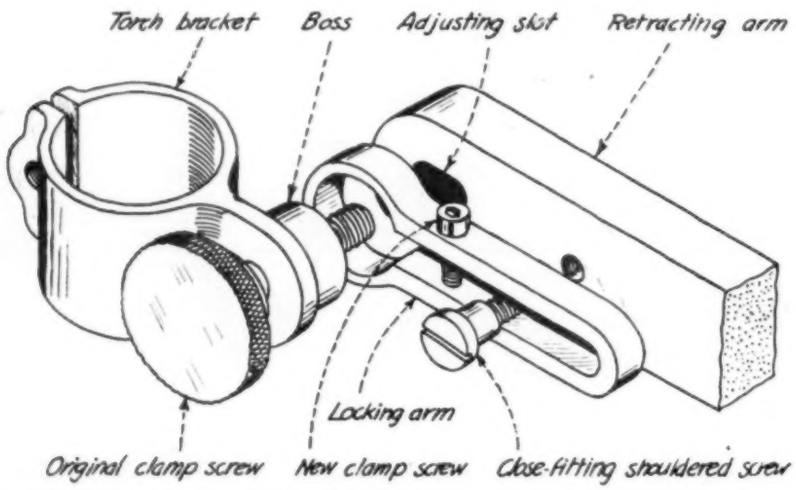
Many swivel-joints depend on the friction of the two mating forces only; the strength depends on the amount of squeeze the screw can exert, the area of the two surfaces and the condition of the surfaces. (Some types have serrated faces, but this makes adjustment difficult).

To guard against such a condition, I conceived a simple but very practical clamp, to guarantee a fixed position of the blowpipe, once it was set at the proper angle. This locking arm grips around the surface of a cylinder. There are several advantages in this: 1. All the area is at the same distance from center so it all has the maximum efficiency. (The face grip type varies greatly from the center out to the periphery as the radius and circumference increase.) 2. The tightening screw in the locking area has a mechanical advantage of about 4:1 because it reduces circumference with a slight lever action and circumference is over three times the diameter (the direction in which force is applied.) But the face-grip type clampscrew has no mechanical advantage. Its force is applied directly, the only mechanical advantage being the pitch of the screw (wedging) and the diameter of the knurled knob. 3. No matter how you improve the face-grip type, the same or similar improvement can be made to the locking arm with much greater efficiency.

The bracket which was furnished to us for holding the blowpipe did not allow for any clamping, except for a hand knob mounted on the pivot pin of the bracket. This could not be made tight enough to hold the blowpipe securely against a sudden stop. The bracket, however, was provided with a boss.

The hole in the mounting arm was elongated to permit in and out adjustment of the individual blowpipes. Therefore, the locking arm required a similar adjustment.

With these conditions established, the locking arm was designed. It consisted of a piece of ½-in. steel, bored at one end to fit the blowpipe bracket boss, and slotted to a snug sliding fit on the shoulder of a drill bushing lock screw. A screw across the slot allows the arm to be squeezed together, tightening down on the mounting bracket boss and the drill bushing screw at the same time.



Locking arm with circumferential grip protects torch pivots from shaking loose and provides short lineal adjustability

Serrated Cam Clamps Light Castings In Multiple Drill Jig

FRANK PERAGINE
Brooklyn, N. Y.

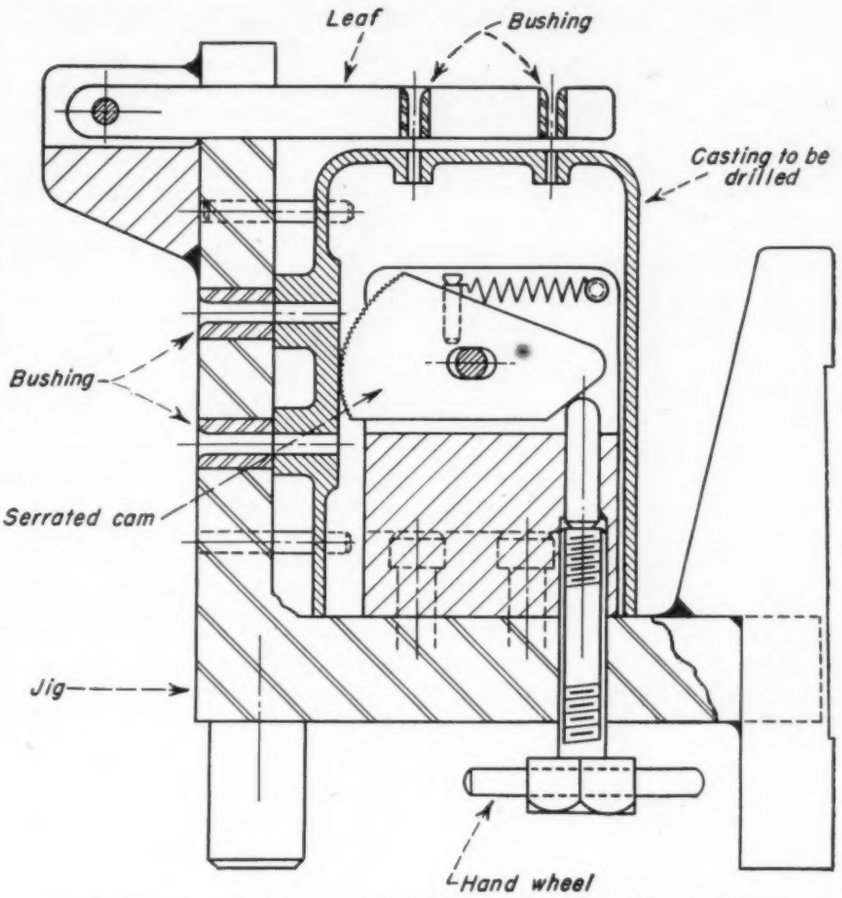
It was desired to drill four holes for interchangeable assembly in a lot of thin-walled castings. There was only one finished surface on each casting

to position the piece but two more "as cast" surfaces were good enough to give the complete location.

The casting fits into the jig we built, and is clamped downward and outward by a serrated cam, whereupon the leaf is closed readying the unit for the drilling operations. This "inside out" action pushes against the heaviest part of the casting, reducing the danger of distortion to a minimum and the cam's motion provides secure holding force against two surfaces.

The jig is made out of machine steel, with the bottom and side feet carefully squared. The jig and work locates under the drill against a vertical surface. When two holes are drilled in one position, the whole unit is turned 90°, located, and the other two are drilled.

The cam pivot hole is elongated to give greater adjustability and the handwheel pushes against an inclined surface thereby pushing the cam in as well as turning it. A return spring retracts the cam when the handwheel is backed off.

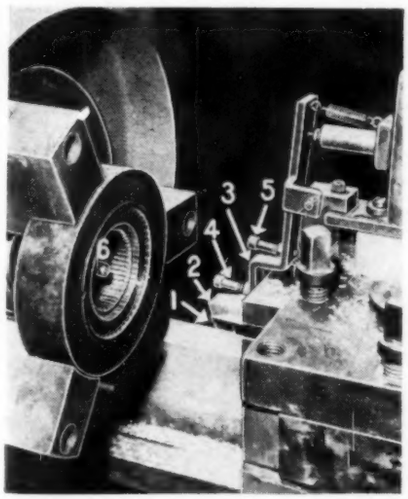


Simple, two-direction clamping with the jig, locks "rough" castings for precision drilling operations

Electric Stops Indicate Proper Depth of Cut

OTTO AUSTIN
Westinghouse Electric Corporation
Lima, Ohio

Commutator production was about tripled with this improved setup for machining the face and vee. The new tool-block holds four tools and two stops which operate microswitches to light an indicator bulb showing when the cut is complete. Air chucking further speeds the operation.



Microswitch, (upper right) operates when stop 6 depresses stop 4 or when stop 5 touches commutator face, lighting the indicator

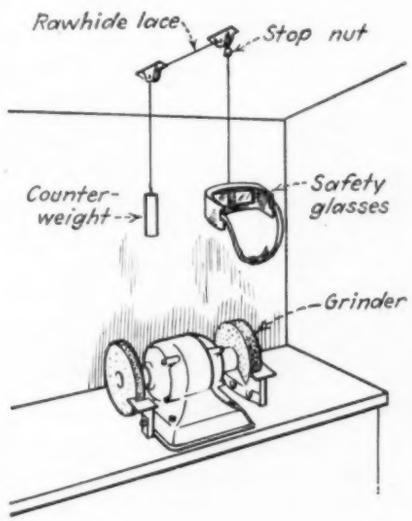
First, the facing tool (2) takes a cleanup cut across the commutator face. Then, the crossfeed is moved to bring the two radius tools (not visible but suggested by 3) and the V tool (1) into position. These three tools are so positioned relative to each other that a single longitudinal feed stroke completes the operation on one end of the commutator. It is then reversed in the chuck and the same operations are repeated.

Make Grinding Goggles Impossible to Ignore

L. RICHARDSON
Cherry Valley, Mass.

Many workmen are just too lazy to put goggles on for a short grinding job because of the time it takes to reach over to a nearby hook.

To eliminate every possible excuse, we hung the goggles or safety glasses from the ceiling in such a way that they were right in front of the grinder, at approximately eye-height. The cord isn't even unfastened as the counterweight is light enough not to hinder head motion. When work is finished, slip off the glasses and they're hanging already.



How To Position a Slotting Cutter

Torsional V-Gage

E. J. ROGERS
Montrose, California

The work to be milled is mounted on the table of the milling machine and the cutter positioned approximately over its center. The centering gage is then clamped to the cutter by means of the adjustable jaws (Fig. 1) which are actuated by a right and left hand thread moving each one equally to or from the center.

The work is raised until it contacts with the swinging angle arm (Fig. 4), the torsion spring maintaining positive contact. The table is then moved in the appropriate direction to bring the pointer in line with the "O," in which position the peripheral center of the cutter is set directly over the axial center of the work.

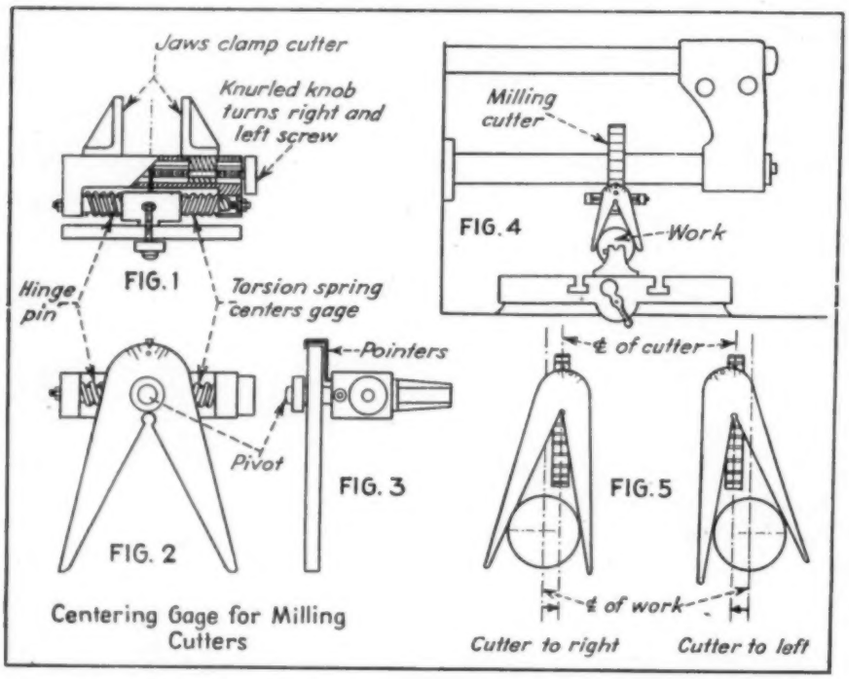
Should it be desired to set the cutter off center, the work is put on the opposite side of the cutter, and the table is fed in with the handwheel until the gage indicates "O." The table is then fed in the desired amount as shown on the handwheel dial.

In milling the end of round stock, for making clutch dogs or castellations, the gage is mounted on the bottom of the cutter with the angle arm in a horizontal position.

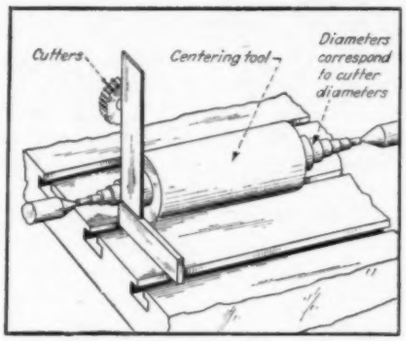
If the cutter has widely spaced teeth or if it is a staggered-tooth cutter, small parallel blocks should be placed across at least two teeth and the gage then clamped to the outside of the blocks.

The swinging arm is removable and can be replaced with ones having different included angles, so if the work is held in a vise, the angle arm can contact the exposed surface without interference from the vise jaws, or an adjustable angle arm similar to a pair of dividers could be substituted. A dial indicator could be used, in which case the hinge pin would be locked. The high reading on the dial will indicate when the centers are aligned, then by running the work lengthwise under the cutter, the dial will show any longitudinal misalignment.

Special adaptations of the tool can be made in various ways. One would be a double parallel jaw tool with a pin joint in the center. Spring-loaded, screwless automatic-centering jaws would permit quick installation on both the cutter and the work and the indication of misalignment would appear between the two members of the gage.



Right and left screw closes both jaws simultaneously and symmetrically over any width cutter and pendulous, torsionally-centered vee indicates misalignment in fractions of an inch on its graduated scale



Square rests against temporary cylinder on the cutter diameter step

Stepped-Cylinder

H. PETERSON
Milwaukee, Wisconsin

One easy and quick way to center a cutter over round work for milling keyways and splines is to have an assortment of short rods or mandrels on hand corresponding to the cutter thicknesses used. It doesn't matter how the work is to be held; this idea works equally well in conjunction with a dividing head, V-block, table slot, centers or special fixtures.

Select a rod whose diameter is the same as the slot and cutter width and mount it in place of the work. Bring a square up against the rod so the stock is resting flat on the table and the blade touches the rod. With the spindle turning at normal speed, carefully traverse the table until the cutter just grazes the square. Now, the cutter is directly over the center of the work within plus or minus 0.0003 in., and without moving the table, the work can be substituted. There are no adjustments or settings to make, no chance for instrumental errors, in fact, it's just a matter of knowing the cutter thickness and rod thickness and taking a little ordinary pains. Actually, a straightedge against the cutter should provide just as good a perpendicular as the square.

Carrying this further, we made a stepped cylinder which had all our frequently-used cutter diameters on it. The steps or measuring sections can be short because they have only to contact the blade of a square, and the center section need only be long enough to rest squarely in a V-block. Of course, the general size of the work and the slots to be cut will determine the best gage size. Ours has a range of from ⅛ in. to 1½ in. cutters in ⅛ in. steps. There are six steps on each end of the cylinder.

V-Block Adapter

H. MOORE
Yorkshire, England

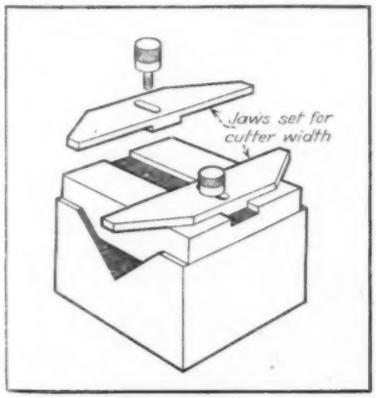
This adapter rests squarely in the top of a standard V-block, and because of symmetry it can be turned end for end. The top surface has a 90° transverse slot to position and guide two keyed jaws so they will always be mutually parallel and parallel to the axis of the V-block.

The adapter can be used in several ways. Graduations are not recommended. For plain centering, I've found it better to set the jaws and traverse the table approximately, then reverse the adapter, note the error, both in axial alignment and in lateral position and make the corrections (cutter width, centering, and alignment). This all takes very little time.

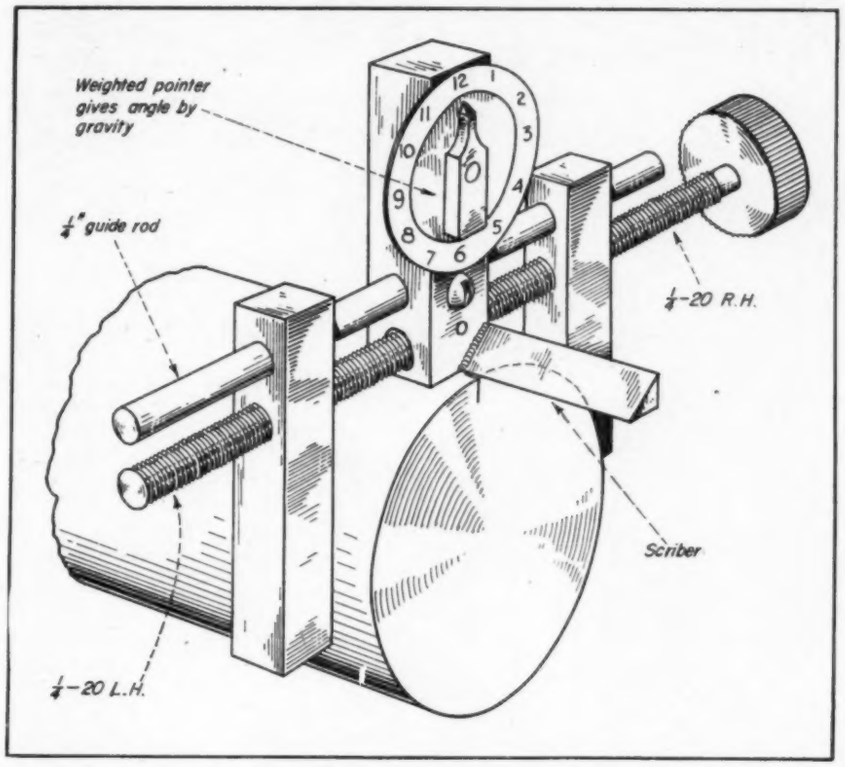
It is useful also as a master gage or set-up gage. If the work and block has to be moved as a unit and then replaced, or another identical block located in a certain position, not necessarily centered, one locked setting of the adapter will provide a permanent gage to locate all work for longitudinal and lateral displacement and angular direction as well.

The jaws are slotted almost the full length of their tongues and knurled screws, tapped into the block, permit width adjustment from fully closed to approximately the full width of the vee.

Although this adapter was made especially to fit perfectly into one particular V-block, it would be perfectly possible to make an adapter with a deep vee and no shoulders so as to fit several sizes giving it a triangular prism shape which would fit into any size V-block for a much wider range of work.



Symmetrically reversible adapter shows misalignment and displacement



Right and left screw centers scriber on any diameter bar. Turning the bar and clamp causes weighted pointer to show angular displacement

Pendulum Gage

HAROLD W. CUTTING
Lompoc, California

Working in a machine shop engaged in repairs, you encounter many new problems every day. Here's an average one with a new solution.

We had to make a replacement shaft which had radial holes drilled in various positions, and a few oddly-positioned keyways. To duplicate all these, I made a device to clamp centrally over any shaft by means of right and left screws. In the center of the screw there is a straight beveled edge for scribing and on the same head is mounted an old watch dial and a counterweighted pointer.

To "copy" any angle and transfer it from one piece to another, clamp the device on the old shaft to be copied with the scriber at the known location, and note the "time" the pointer indicates. (If there are several locations to be transferred, leave the shaft in position and continue to take the "time" at all desired points, noting the values on a piece of paper.) Now, switch pieces, clamp the gage lightly in place on the new shaft and turn it until the pointer shows the same "time," then scribe a line.

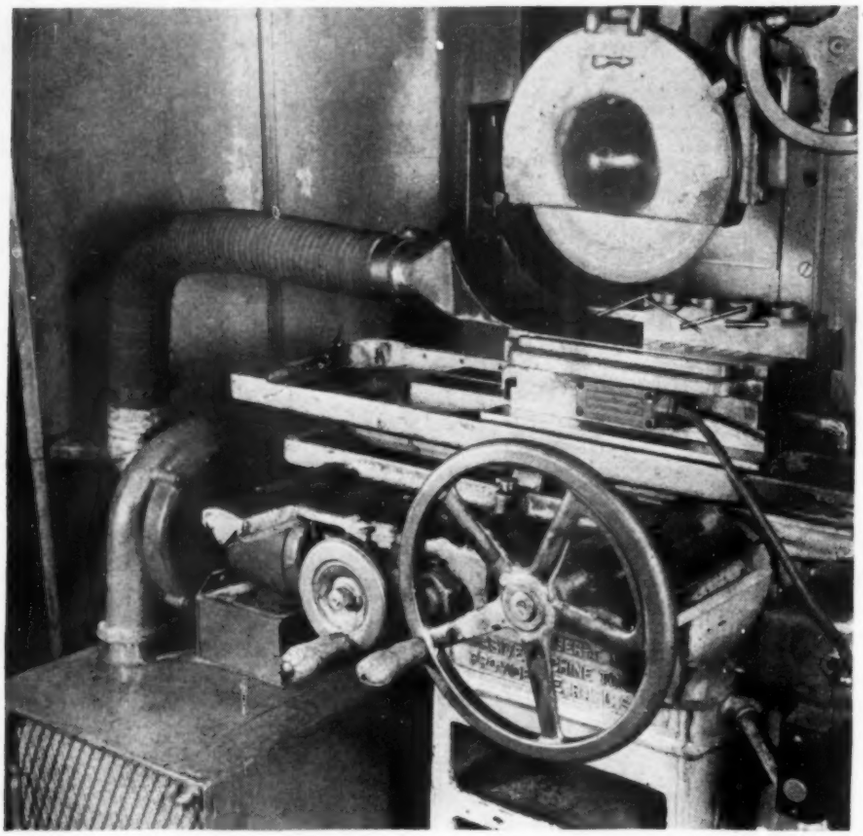
Sometimes it is necessary to space holes around a piece at equal angular intervals where speed of setup is more important than extreme precision. As there are 60 min. in 1 hr., and 360° in a circle, each minute on the watch dial equals 6°. (If desired, a 10-cent protractor could be substituted, or made interchangeable.) To mark off any angle, say 49°, scribe a zero mark on the clamped shaft (if one is not already present) with the weighted pointer exactly at 12. Swing the gadget around until the pointer shows the correct angle.

Hooded Surface Grinders Remove Abrasive Dust

ROBERT A. SHAW
Detroit, Mich.

Frequently or continuously-used grinding machines should be isolated as much as possible from other, less-protected machinery and should be equipped with a dust remover as well.

It is possible to build on a small blower which will operate whenever the spindle is turning to pull the dust and filter it. The blower may

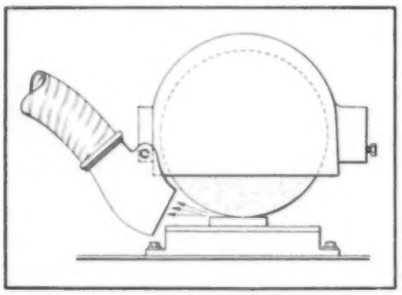


Well-designed, permanent hoods collect abrasive dust before it can find its way into machine bearings

be driven directly or by a separate motor according to the machine.

Troubles with dust-collecting systems usually focus on the hood design and application. Here are two successful kinds of hoods for general-purpose work. One is fastened to the edge of the magnetic chuck and its flexible hose does not interfere with the table motion. Another type is the pivoted hood. This design can be quite small as it is always right over the work regardless of the table travel.

Remember, always keep woods as close to the dust source as possible.

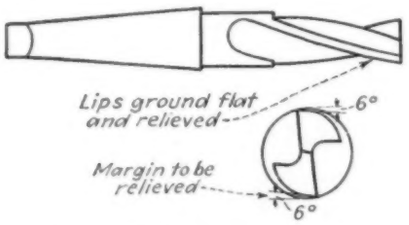


Pivoted hood stays close to work

How To Utilize Broken Taper-Shank Drills

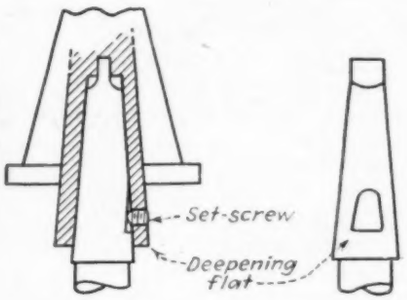
H. LANDAUER
Tampa, Florida

LATHE CENTER—Taper-shanks make better centers than the commercial product because, if ground correctly, they have a high-speed tip but a tool steel shank. If the tang gets in the way, cut it off.



END MILL—Grinding square the remaining flutes of a broken drill, then relieving, makes an excellent two-lipped plunge for peripheral cutting. A radial cutting clearance of 6° is recommended.

SECURING TAPER SHANKS — The troubles with loose taper-shank drills and mills have been attacked in many ways. My solution is to grind a flat near the large end with a reverse taper. Then, the setscrew will exert an upward pressure on the taper shank because of the wedging action and the tool can not drop out.

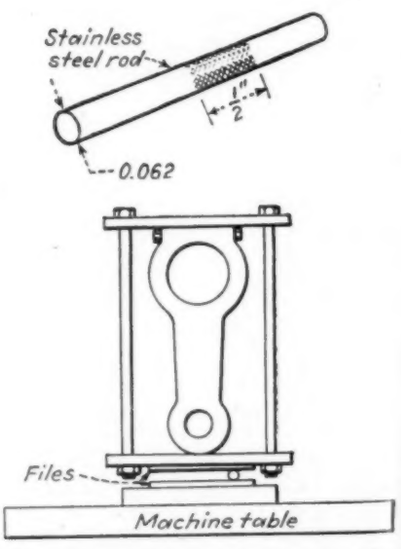


Pillar Files Knurl Stainless Steel Rods

PAUL E. SHOEMAKER
Williamsport, Pa.

We had to put ½ in. wide knurls on 200 1/16-in. stainless steel rods but we didn't have a knurling tool small enough.

Two double-cut ½-in. pillar files were mounted on cold-rolled backing blocks. One of those was fastened on the table of a milling machine, the other on the overarm. Work was laid at right angles to the files and the knee brought up until the two files began to squeeze the rod. Longitudinal feed rolled the rod, producing knurls, and though they weren't perfect, they were passed by the engineering department. Rejections were few.



Two pillar files can knurl a rod by rolling in a milling machine

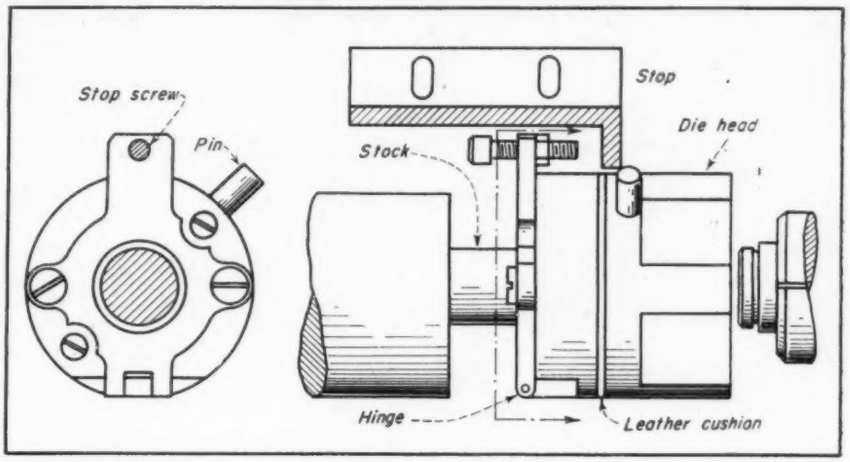
Diehead Improvements Solve Small-Thread Problems

I. K. SCHLAMP
Seattle, Washington

We have used a Landis head a number of times on a 2G Brown & Sharpe automatic to cut a short fine thread close to the shoulder on brass parts. Considerable difficulty was experienced, and the following explains the troubles encountered and how they were corrected.

As there were only 2½ threads on the parts to be threaded, there was not strength enough to open the diehead without pulling the threads. Also, as the material was brass, the rake had to be ground off the chasers and it was necessary to use short-throat chasers. This in turn caused the float in the diehead to give trouble. The cams were milled but when the diehead touched the work, the longitudinal float was taken up due to the 0° rake and short throat. Then, after the diehead started to cut, the starting pressure was released resulting in off-pitch threads, the same as though the cam lead was too fast. To correct this, a leather washer was inserted which cut down the float but still allowed some cushioning. The regular diehead is opened by stopping the turret and allowing the diehead to pull off the locking pins, or by placing a stop inside the diehead to contact the work being threaded, which allows the diehead to pull off the locking pins. In both cases it would strip off the fine threads when opening. By weakening the springs the diehead could not be controlled accurately, sometimes opening short and other times hitting the shoulder. Also, light springs would not insure the diehead closing each time as they worked too slowly.

The accompanying sketch shows how this was overcome. A hinge which carried locking pins was mounted on the diehead allowing the diehead to open when the stop-screw contacted the bracket, thus controlling the exact opening position very accurately. On the same bracket, a bar contacting the closing pin closed the diehead as the turret indexed into position. By pulling the pins which hold the diehead closed, as described above, no pull-off pressure is carried by the threads and the diehead can be set to open very close to a shoulder.



Leather washer and adjustable stops open and close diehead

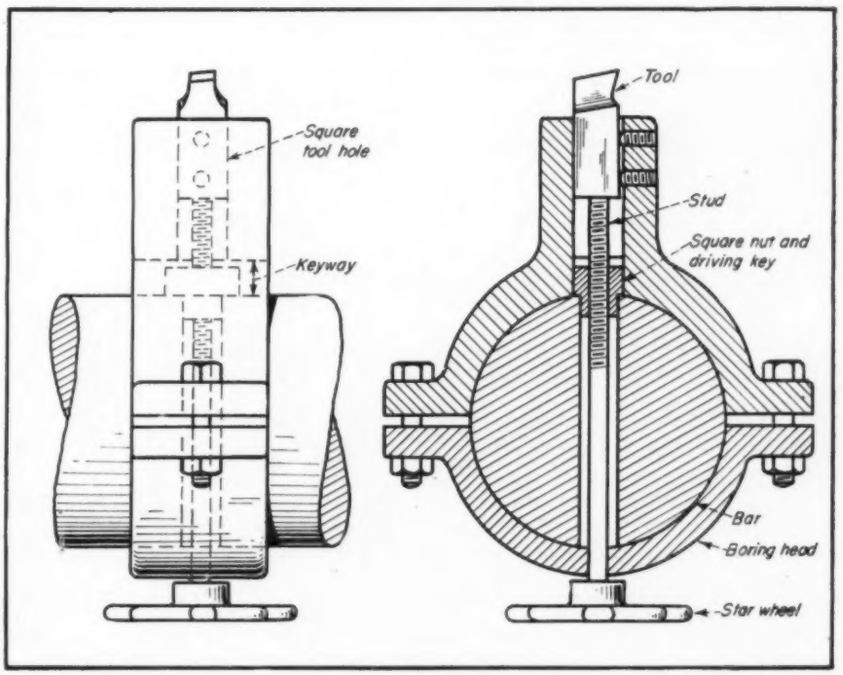
Screw Feed Improves Grooving and Boring Head

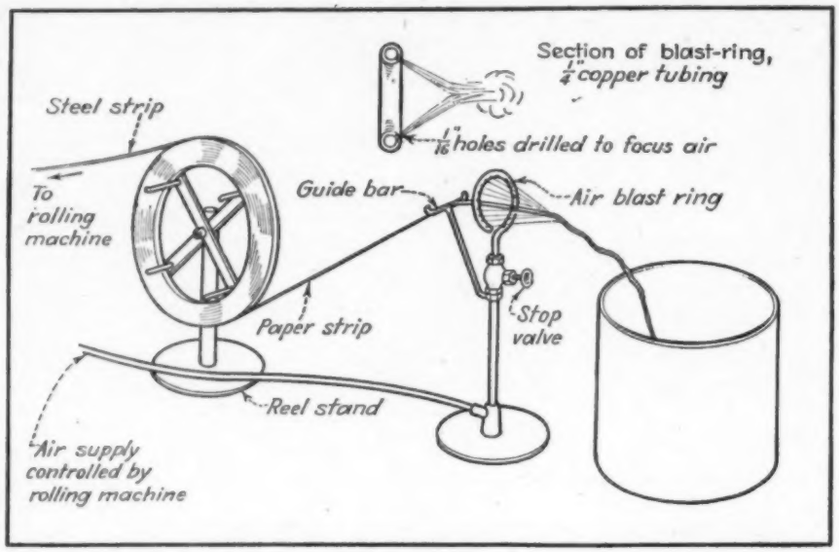
A. F. SCOBLIC
Milwaukee, Wisc.

The old method of tapping out a tool with a wedge for a grooving operation in a large bore was greatly simplified by the application of a stud and nut to feed the tool as the boring bar turned.

The boring bar is provided with holes that are ordinarily used for tool bits. A standard-type boring head is used, with the tool slot placed directly over the hole in the bar. A nut is provided, which also serves as a driving key for the head. The nut fits into the hole in the boring bar and is provided with a square head, to prevent turning.

In assembly, the nut is first placed in the hole of the bar and the boring head is then clamped in place. The tool is inserted and the setscrews pulled up sufficiently to permit the tool to be forced out by the turning of the screw. The screw and star wheel are added to the assembly and the head is ready to be moved into position for the grooving. As the boring bar rotates, the star wheel may either be turned by hand, or fed automatically by a trip plate. Upon completion of the grooving operation, the setscrews are loosened and the tool lowered to clear the bore for withdrawing the head.





Quick-acting air valve operated by the machine, starts and stops air blast as the machine starts and stops

Air Blast Removes Paper From Steel Strip Roll

FLOYD H. HARRIS
Cincinnati, Ohio

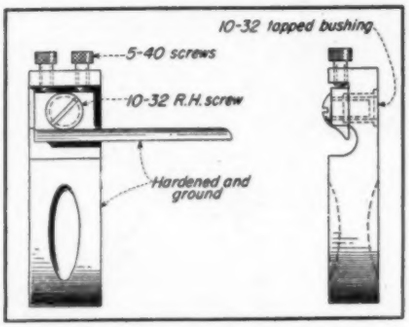
Dividing paper in rolls of stainless steel strip had a tendency to follow along or to become tangled in the reel stand as the steel was fed into our rolling machines.

We solved this nuisance by making another stand out of pipe, headed with a ring of ¼-in. copper tubing large enough in diameter to pass the paper easily. The air supply line leads to the rolling machine where there is a button-valve operated by the control bar of the machine itself. The tube ring has 1/16-in. radial holes drilled all around to direct air jets in a cone where their combined effect exerts a force on the paper and pull it along, separating it from the steel. There is an adjustable guide bar to keep feeding the paper correctly so it won't rest on the lower surface of the blast ring.

Die Square

HAROLD R. DAHL
Chicago, Ill.

Similar to a square designed by Mr. Howard DeHeer which appeared in "Practical Ideas" a few months ago, this has the slight advantage of an open side enabling the user to observe the blade from any angle right up close to the stock. Construction is simple and the tool has proved most useful.



Open-side stock on this square permits full-length observation

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Until further notice, an extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

Payment—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

Judges—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, will hereafter select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. The decision of the readers will be final in each case.

Requirements—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

Who May Enter—Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments.

How to Enter—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St., New York 18, N. Y.

Eighteenth Selections—Charles Kidwell—Double-edged Countersink
W. W. Quist—Threading Dial

NEWS OF METALWORKING

Emergency Machine Tool Reserve To Be Submitted to New Congress

WASHINGTON — Legislation to create an emergency machine tool reserve is being drafted for presentation to the 80th Congress by Army-Navy Munitions Board in collaboration with Army and Navy and with representatives of the industry.

The draft proposes an appropriation for the purchase of special-purpose and long-supply machines now in possession of War Assets Administration and Defense Plant Corporation. Such an appropriation would merely take money out of one of the government's pockets and put it in another, but authorities deem it necessary under law. Only alternative would be appointment of WAA as a set-aside agency.

Two Plans Considered

Officials writing the draft are considering the relative merit of creating a national reserve for the use of all federal agencies, or a reserve for each of the services, in either case to be administered by the Munitions Board, with machines physically in possession of Navy yards and Army Arsenals.

Proposal is to put only surplus machines in any reserve; officials said they would not recommend purchase of new production for standby.

So far, few if any surplus machines have been moved out of surplus back to Army and Navy storage. Munitions Board is in process of locating and invoicing equipment desired for reserve. Legal advice is that the services can take possession of the equipment, but they cannot take title until Congress so authorizes in the proposed Reserve Act.

Questionnaires Sent Out

National Machine Tool Builders Association is questionnairing industry members for: (1) opinion on what machines should be reserved, and (2) what machines were built for war purposes. Munitions board officials said they had not been informed of this survey, and had received no data resulting from it.

All sources concurred in opinion that very little equipment vital to the reserve has been scrapped. They said the services would not have declared surplus machines of emergency value, and if they did, they alone are to blame for the loss.

Responsible persons said they could not estimate size of the reserve in units, but it should be "large."

Assignment of long-supply machines to a reserve would proportionately remove a long-term threat to the market for new production. Storage of special-purpose machines, standard machines having elaborate attachments, very large units, would alleviate the need for inordinate expansion to meet emergency.

60% of Finished Steel Tonnage Shows Effect of Price Advance

PITTSBURGH—Price advances are being placed into effect well along the line of major steel products. At this writing, approximately 60% of the tonnage of finished steel is involved in items where quotations have advanced. It appears a foregone conclusion that the others will be affected as well, although some further changes may be deferred until sometime this month.

One interesting aspect of price advances in steel is their ready acceptance by consumers. This may reflect a sellers' market in this primary industry product, but it must connote, too, a belief on the part of mills that the sellers' market will continue for some time.

Some steel officials, in this connection, are unusually optimistic in respect to the outlook for the new year, holding that only an interruption to production in the form of strikes can prevent a new high in ingot output in 1947. Strikes cut about 20,000,000 tons of ingot steel from 1946 results.

This does not mean a constant repetition of the unsatisfactory supply conditions which prevailed during 1946. There will be times when supply and demand will balance temporarily, or appear to do so.

Navy Sets Total Surplus Property At $14 Billion; 26% Still Remains

WASHINGTON—The Navy, in a hitherto restricted report, says its total surplus property is $14,393,000,000, of which 74% or $10,583,000,000 has been disposed. Navy sells some surplus itself, declares most to War Assets and to Foreign Liquidation Commission. Unlike other agencies, it includes declarations in disposal figures, thus the report does not show how much is actually sold. Even Navy's own disposal figures include some transfers.

Surplus vessels total $4,950,000,000, of which 62% have been disposed; aircraft, $1,081,000,000 with 96% disposed; contractor inventories including scrambled facilities, $2,695,000,000, of which 81% disposed; industrial facilities, including DPC plants, $291,000,000, with 55% disposed; other real property, $344,000,000 with 48% disposed. Of the total surplus, $2,500,000 is overseas.

Automobiles Wear Wings—An airplane wing section secured on one side of a car enables it to speed safely around the circular track on U. S. Rubber Company's tire proving grounds near Lancaster, Calif. Wing counterbalances centrifugal force on curves and creates test conditions more like normal highway driving. In photo, the car is passing the camera at 90 m.p.h.

Gaging Business

Metalworking in Full Stride

The metlaworking industries are in full stride again. January should be a big production month in almost all segments, provided serious strikes do not occur. The materials situation is not good, but is better than it was. Coke, pig iron and castings continue to cause anxiety because they are seriously short at many producing centers.

Steel Mills Have Fat Backlogs

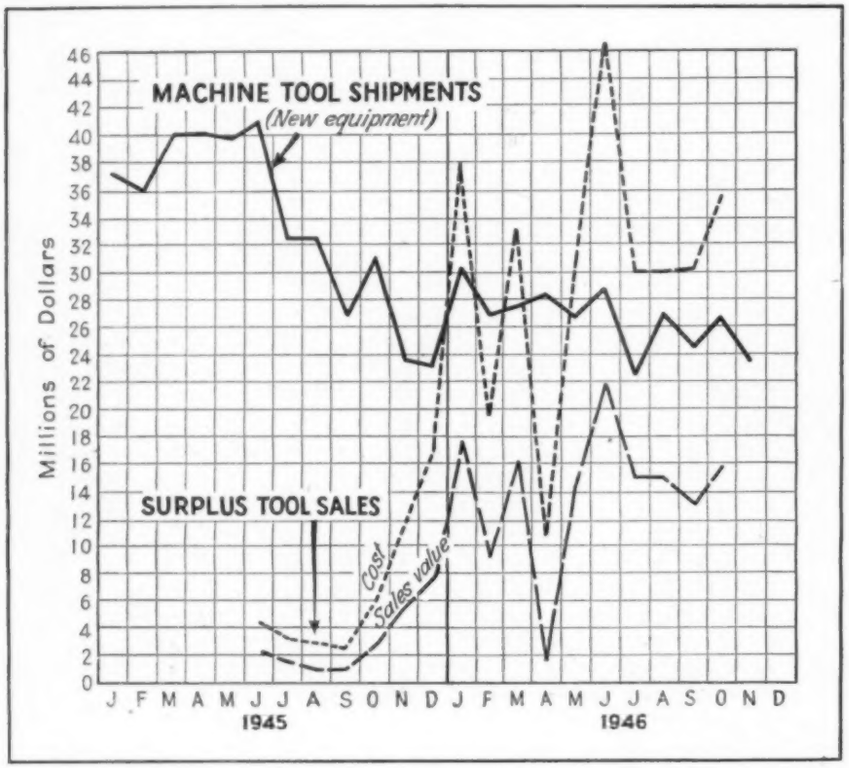
Steel mills enter the new year with fat backlogs. The selective selling policy, utilized largely during the past year, will be continued in 1947. It gives preference to orders in consuming zones near to the particular mill involved, and saves freight.

The acute shortage of sheet and strip steel will be relieved as 1947 wears on. One big new mill is scheduled to come in during the winter, and another in the spring. Though Britain is in dire need of steel from this country to keep her industries running at or near top speed, relatively little steel is being exported because it is required so urgently at home. Price pressure in steel is still upward. It is estimated that a 10% increase in hourly wage rates will necessitate a boost of $2 a ton or more in steel prices.

Electrical Equipment Orders High

Orders for electrical goods of all kinds are at a peak and little progress is being made in whittling down backlogs. Makers of turbines and motors are solidly booked through 1947, and in the case of fractional horsepower motors the piling up of orders represents full capacity output for 24 months. Radio receiving set manufacturers are straining to push up operations, particularly on the larger models. Competition for business is keen, however, in table sets, with many newcomers in this field.

Refrigerator, automatic heating and air-conditioning companies are very busy and would be at a still higher level if they could get enough sheet steel. Producers of television sets are expanding their facilities. It is likely that during the next twelve months some 300,000 sets will be built. All household appliance makers are limiting production only by the amount of materials at hand.



Coal Strike Affects Shipments—Lowered machine tool shipments during the month of November reflected the restrictions during the latter part of the month due to the coal strike. Total shipments netted $23,603,000, while new orders slipped to $19,138,000, cancellations to $1,341,000 and unfilled orders to $168,997,000. Foreign orders were proportionately lower than those for the preceding month

Locomotive Builders Busy

Locomotive builders have their hands full for months ahead. Electro Motive Corp., for one, has a plentiful supply of orders for diesel-electric engines which will keep its plant fully engaged all year. Union Pacific has placed 64 diesel-electric passenger, freight and switching locomotives with three companies. Vulcan Iron Works has received a substantial order for locomotives from Turkey.

Big Year for Farm Implements

Farm implement and tractor firms are trying to step up operations as rapidly as possible to meet an all-time high demand during '47. They still are hindered by strikes. The automobile industry is anticipating a big January, and chances appear good that there will be no major work stoppages during the month. Most companies hope to run right through the year without interruption for new models. The proposed show in New York next fall has been cancelled.

Machine Tool Business Declines

Machine tool business was on a declining scale during November, and the trend continued through December. Shipments, new orders and backlogs were off from those in October. Shipments were down almost $3,000,000 and new orders $3,500,000. Unfilled orders on December 1 stood at $168,997,000, as against $175,984,000 the previous month. The size of backlogs is deceptive, however. They do not represent an even distribution of orders throughout the industry. Instead, unfilled orders tend to be concentrated in a limited number of companies and many types of machines are available for delivery to customers within a few weeks' time.

Foreign Machine Tool Sales Up

Shipments of machine tools in November amounted to $23,603,000. They would have been more the past 60 days if virtual embargoes at New York had not held up machines destined for export. Foreign sales are looming large, in November having accounted for 31% of new orders. Machine tool builders continue bothered by stiff competition from surplus government tools. Of 24 groups of surplus property now offered in 565 sales throughout the country, machine tools comprise the biggest group, being valued at $511,951,000, acquisition cost.

WAA Disregards Industry Advisors In Plan to Export Machine Tools

WASHINGTON—WAA has plans for screening out acceptable machine tool dealers and approving a selected number for reconditioning or rebuilding surplus machines. These dealers then would buy machines at the same prices paid by other types of buyers and at a later date report the numbers and types of machines sold abroad. On those machines to be exported, dealers would be allowed a 12½% commission on the price they originally paid for the machines. No commission would be permitted on rebuilt machines sold to domestic customers.

This plan is being put into effect without consultation by WAA with the Metalworking Machinery and Equipment Contract Dealers Advisory Committee of WAA. Builders of machine tools are expected to show little interest in the plan because they cannot afford to take in surplus tools at the prices set by WAA, rebuild them and sell them at a profit abroad or at home. It is hard to get more than 60%-70% of the original price for rebuilt tools.

The machine tool industry fears that under the proposed plan many machines will end up in the hands of foreign buyers without adequate precautions having been taken by dealers in the rebuilding process. If this should happen, it would damage the reputation of the builders involved and their foreign agents would be called upon to service these machines. It was this sort of practice—selling tools abroad without proper reconditioning—that gave many U. S. builders a black eye after the first world war.

Casting Process Developed To Avoid Defective Parts

CHICAGO—Foundries are intensely interested in a new casting process developed at Armour Research Foundation which promises to solve the problem of defective castings. Known as counter-gravity vacuum casting, the new process brings the metal into the mold from below, rather than by pouring from above. Molds are enclosed in a vacuum box, and are connected by refractory tubes to a metal supply below. Metal is sucked into the mold free of slag and essentially free of gases. In test runs of several thousand castings the new method has cut rejects to 1 or 2% from the average of 5 to 10% in the foundry industry.

Laminated Plastic Panels Slash Tool Cost on Interior Car Trim

DETROIT—Diemakers find significance in the Briggs Manufacturing Co. development on plastic interior panels. If this innovation meets with production acceptance, it may seriously deplete the number of interior panel dies now required, supplanting them by cheap wooden molds.

Briggs plastic panels are now being used in place of steel panels on a DeSoto station-wagon-type body. The plastic is laminated under heat of about 300 F. and about 900 psi. After being held in this stage, it is transferred to the mold and put in, still hot. A short cooling period shapes the thermosetting plastic into permanent form.

Inasmuch as the pattern—which can simulate wood grain or any other which can be photographed—runs through the plastic section, wear only burnishes it brighter.

Door panels have been developed with a base scuff plate of plastic combined with a center section of textile and topped by the window garnish molding. Plastic and fabric are pressed out simultaneously, the fabric being cemented to a backing. Hand sewing is eliminated.

This process, says Briggs, can eliminate door panel dies which may cost $20,000 by use of wooden molds costing about $500. Press time is longer, so more presses may be required, but all in all the company figures it competes favorably with steel-and-textile units. Briggs does not indicate whether the door panel has been specified for 1948 model output.

Columbia Steel Ready to Purchase Fabricating Plant for $8 Million

SAN FRANCISCO—Subject only to stockholder approval, Columbia Steel Company is ready to buy the Consolidated Steel Corp., thus adding a fabricating setup to U. S. Steel's growing family on the coast. A total of $8,293,319 was offered for the fixed assets, with certain adjustments for inventories and work in progress at the time the transaction is completed.

The move will iron out another problem for Geneva. The big Utah property can produce structurals, plates and sheets in excess of the normal western need. Consolidated has always been a customer of whoever could supply its demands, but now Kaiser Steel, Bethlehem and others will be minus this outlet.

Besides the industrial outlet for fabricated steel products is the pent-up demand for federal, state and local governmental construction.

Scrap At Low Ebb

Supply of scrap steel on the west coast is at its most harmful low ebb. With demand greater than ever before, about 27,000 tons per month are available in a market that normally would consume 11,000 tons. Much demand has arisen for the Maritime Commission to scrap idle ships.

Many open hearths are shut down for lack of scrap. Columbia has scrapping facilities at Western Pipe and might try to relieve its own scrap shortage by obtaining considerable tonnage from the Maritime Commission.

Army-Navy Take Steps to Overcome Public Pressure for Unification

WASHINGTON—Public opinion is set to compel eventual unification of the armed forces. The military commands, even in Navy's opposition, recognize this and are moving toward coordinated operations, hoping to forestall drastic action by Congress. Latest move is establishment of 7 area commands throughout the world, each under an officer of Army, Navy or Air Forces.

Less dramatic, but equally important, is the increasing coordination of procurement by Army and Navy. Vast quantities of common-use (commercial) items are bought jointly, or in collaboration, or by one service for the other. Even some technical equipment is procured cooperatively. Army-Navy Munitions Board is assigning numerous technical items to Army or Navy branches best qualified by experience to specify and buy them.

Navy shows in a report that of $50,000,000,000 Navy funds spent in 1944-45 for materials, Navy contracted 10% for Army; Army 10% for Navy; Navy bought 9% in collaboration with Army; 12% was joint procurement; field and other coordination, 17%; total coordination 58%; leaving technical Navy procurement, 42%. Maximum coordinated procurement may run as high as 75% in future. That, plus identical procurement procedures by Army and Navy, will vastly simplify selling to the government.

A major uncertainty in Federal procurement is price inflation. Currently, the services are approving contract price escalator clauses with a 20% ceiling. Some contractors are pressing for 30%.

Nonbasic Steel Manufacturers Ask Voice in Collective Bargaining

CLEVELAND — Manufacturers represented by the recently formed Nonbasic Steel Coordinating Committee are hoping they can take action to prevent their hands from being tied by outcome of contract negotiations between the United Steel Workers of America, CIO, and the basic steel industry. The committee represents manufacturers who use steel, even in a minor way, and other materials in producing hundreds of different finished products.

Because these nonbasic manufacturers have contracts with USWA, they have been lumped in the past with basic steel in matters of collective bargaining and have been compelled to accept wages and working conditions agreed to between the USWA and the basic steel companies.

Work Stoppage Recalled

When the January, 1946, strike was called by USWA against basic steel companies, the work stoppage forced the closing of 1,100 plants of nonbasic steel manufacturers. Upon settlement of the strike with basic steel companies, nonbasic plants discovered it was to be continued against them unless they were willing to pay the basic steel wage increase without any guarantee of price relief.

In a majority of nonbasic plants, USWA obtained the same wage rate as granted basic steel employees. However, some nonbasic plants were closed until April and May, with a few remaining shutdown until June.

Nonbasic manufacturers were particularly irritated by the fact they had no voice in bargaining that went on between government, the basic steel industry and the union. Nevertheless, they were shut down when the principals failed to agree and then they were virtually forced to comply with the issues upon settlement.

Tell Plight to Government

In view of the experience, the nonbasic steel group has been busy educating governmental officials with their problems. Manufacturers have repeatedly stressed the point they are not attempting to abridge any of the rights of organized labor but they are asking for real collective bargaining at local levels.

Freight Rate Increase Expected To Boost Rail Equipment Orders

CHICAGO—Rail equipment makers in the Chicago region anticipate a flood of orders to follow the boost in freight rates granted by the Interstate Commerce Commission. While freight car makers have a sizeable backlog of orders, they could wipe it out in five months at capacity output.

If quantity orders for rolling stock are placed, they will allow production economies that will improve operations greatly. Railroad passenger car business should also be stimulated. While Pullman-Standard and other producers have large backlogs of orders for passenger cars, they are hoping to extend sales into some relatively untapped markets. Of Pullman-Standard's total production schedule of 1,848 cars, for example, not a single one was a modern suburban coach.

Report on Coal Strike Effects Studied By Chicago Area Plants

CHICAGO—While it is in the nature of a post-mortem, Chicago area metal-working firms are studying a report on the effects of the coal strike prepared by the Chicago Association of Commerce after an extensive poll of manufacturing concerns.

The report demonstrates that the embargo on freight shipments had the most serious immediate effect on production. The great majority of companies said that "no parts or materials from suppliers" was the most restricting factor, followed closely by the inability to ship finished goods. Restrictions on the use of electricity, next to the embargo, was the most hampering effect. Lack of coal was next—a commentary on the gradual swing away from the direct use of coal in manufacturing operations.

Production Cut 10%

As it actually worked out, metal-working companies were more harmed by the strike than other types of manufacturers, or than service industries. Production cuts ranged around 10%.

When the strike ended, the recall of workers laid off was prompt. Oliver Corp. had 72% of the 10,000 employees in seven plants laid off back on the job immediately, and the balance returned the second working day. Pressed Steel Car Co. called back 1,000 workers, and Great Lakes Spring Corp. recalled 1,300.

The end of the coal strike did not signal a return to labor peace, however. International Harvester and the CIO Farm Equipment Workers are bargaining on pay raises and a guaranteed annual wage. After an 80-day strike last winter, Harvester and the union agreed on a one-year contract expiring April 15, but it provided for reopening of the wage question. According to union sources, the company has already agreed to the principle of equal pay for men and women doing the same work. Half of the employees at Harvester's West Pullman Works are women.

General Raise Sought

The union is asking Harvester for a general pay raise and an increase in all minimum rates to more than $1 an hour.

One of the nation's longest strikes —that against Allis-Chalmers—has been running since last April 30. Thus far, a study of the situation shows strikers have lost more than $20,000,000 and the company has suffered a net loss of $17,000,000. Company officials point out that in the nine years since the CIO has been bargaining agent for Allis-Chalmers workers, employees have lost a full year's work as a result of strikes, sitdowns, and work stoppages. In the first 90 years of the 99-year-old company's existence, there were only two strikes.

1947 PARIS FAIR TO BE HELD MAY 10-26 IN LARGER SPACE

PARIS, FRANCE—The 1947 Foire de Paris will be held from May 10 to 26 again at the Porte de Versailles. It will overlap the British Industries Fair scheduled to open May 5. It is reported that requests for exhibiting space received already absorb the greater part of the available area at the Foire de Paris.

An additional 36,000 sq. yd. of space will be made available compared with 1946, of which 15,000 sq. yd. will be in a new additional hall to be erected on the site of the former car park, and to be linked by an underground passage to the main buildings.

Military Standardization

WASHINGTON—Further standardization of military aircraft, components, and parts has been initiated by the Aeronautical Board—representatives of Army Air Forces and Navy Bureau of Aeronautics, collaborating with Aircraft Industries Association. Industry will review and comment on all revised and new Army-Navy aeronautical specifications prior to final issue. Coverage of the industry will be by AIA aircraft, engine, and propeller technical committees. Initial standardization will be in bolts, nuts, rivets, tires, rims, wheels, radio and other components.

Detroit Letter

Two Viewpoints on Labor

Two viewpoints prevail in Detroit on the current labor situation, and each is equally tenable. The one holds that wholesale walkouts will take place next year, as they did in the winter and spring of 1945-1946, badly crippling automobile output. The other maintains that today's threats and demands by labor are bluffs, pure and simple, extremely unlikely to be backed up by large strikes.

Those who hold that major strikes lie ahead point to several undeniable facts. Living costs have risen, and worker wages have not kept pace, kindling fire behind the current pay demands. Even though the now-celebrated Nathan report made for the CIO stressed that different situations prevail in different industries, a uniformity of pay raise pattern is promised by past history, and some companies, like autos, will be unable to meet larger advances others may make. This school of thought holds that the entire union movement has developed an unprecedented class consciousness and class warfare in America which will erupt in strikes upon strikes.

Obstacles to Labor Conflict

The opposite viewpoint takes the position that notable obstacles stand in the way of major 1947 labor conflict. For one thing, and extremely important, too, Congress will be considering new labor legislation, any outbreak will stiffen the sanctions which are likely. Second, labor leaders know—though they won't admit it—that wage increases mean further price advances, and that they realize they are reaching a temporary end to the pay raise road. Third, if a minor business dip occurs, it will dampen the argument for more money.

So far as the auto industry is concerned, there is an equally potent factor to be noted in the attitudes of the rank-and-file. The auto union as a whole wants the industry cat belled, but no local wants to do it. To call a strike in General Motors this year, informed opinion holds, would be impossible after the long walkout of 1945-46. Chrysler workers want more money, but do not want to be the strike guinea pig. Ford workers feel about the same way.

Auto Makers Back Suppliers

Conceivably, then, the situation could eventuate into one of strikes in bottleneck suppliers. This was the original pattern of pressure on the auto companies back in 1936 and 1937, and it worked then. Impelled by fears of losing their business, supplier after supplier settled on the union's terms and finally made a pattern too strong for the auto makers themselves to withstand.

What the union doesn't know is that the auto makers are backing up suppliers today when they become strikebound.

So far as is known, no company has lost customer contracts as a result of strikes during the past year, even though some suppliers were out months and months while competitors supplied their outlets. But unionism may not realize this change from 1936-37.

1947 Models Shipped

Meanwhile, affairs go on in a little more normal pattern than has been the case earlier. The new 1947 models are being shipped. Hudson was the first to start 1947 model shipments, having changed practically overnight. Like the other cars, the new Hudsons are changed only enough to distinguish which cars were made and sold in 1946, which in 1947. The industry's changeover to 1947's is a goodwill gesture more than anything else; it protects the 1947 car buyer from the depreciation he would encounter in the future if his car could not be told from one built the year before.

Tool and die work continues to be placed for 1948 models, and more is in the cards despite the program cutbacks in General Motors, remarked on here earlier. Companies are finding satisfactory deliveries on machine tool requirements, and none anticipates holdups on that score.

Transfer Machine Significant

This brings to mind recent remarks made on the performance of transfer machines by J. H. Mansfield, chief engineer of Greenlee. Speaking before the Society of Automotive Engineers, Mr. Mansfield cited a crankcase job being done in an unspecified plant today, comparing output on a transfer machine with that formerly done on an orthodox line.

To mill, bore, ream, tap, and do other operations required for the case on the line of machines called for 24 operators and two toolsetters. Today, on the transfer machine, 12 operators and three toolsetters handle the work. More intensive tooling partly balances this comparison, there being 377 tools required for the line, 428 for the transfer machine.

But the great advantage of the transfer machine has been its output in this day of relatively low shop efficiency, as Mr. Mansfield saw it. He noted that before the war the machine line turned out 40 pieces per hour, and output today is down to 30—a decline of 25%. But the transfer machine, set for 52 pieces before the war, is down now to 45, or only 12.5% off.

Improved Safety Factor—The lowered center of gravity on this 1947 Studebaker Champion permits the car to tilt to an angle of more than two-thirds off horizontal without going over. The mechanic in the picture holds the car at its center of balance in a demonstration of stability

Results of Surplus Disposal Plan Discussed at CTMA Annual Meeting

DETROIT—A record turnout heard reports of progress of the Cutting Tool Manufacturers Association at the annual meeting of the organization in Detroit, Dec. 17. Attendance at the dinner and evening meeting was spurred by the presence of Maj. Gen. Leslie R. Groves, who directed the atomic bomb project during the war, and of Tell Berna, general manager of the National Machine Tool Builders Association.

An important phase of the discussions centered around the surplus tool disposal plan which was originally developed by the C. T. M. A. a few years ago. Approximately 25 companies belonging to the association entered agreements with the War Assets Administration to carry out this program. About a fourth of these agreements have been cancelled, some by companies which made nothing but special tools and consequently are getting none back, the others by companies which felt they have received back substantially all tools declared surplus.

Complaints on Scrapping

Some complaint was registered that provisions of a recent amendment to the general procedure have not been followed by the Government. This understanding, reached some months ago, was that special single-purpose tools should be sold as scrap after approval by a special scrap panel, agent companies buying them back at 2½¢ per lb. and moving them into scrap channels.

A few companies indicated that after they had summoned scrap panels, they did not get back the tools, which were shipped to depots, apparently for ultimate sale.

A large share of the meeting was given over to discussion of labor problems affecting the member shops. The concensus was that substantial changes were required in applicable laws in order to make a more workable arrangement. The keynote of this thinking was that the positions of management and labor must be equalized at the bargaining table.

Equalization Platform

The platform developed at the meeting called for restoration to employers of free speech rights denied them under interpretations of the Wagner Act, granting to employers of initiative in seeking bargaining elections, change in the Anti-Trust Laws to make them applicable to unions, and, as a related move, the elimination of the Norris-LaGuardia Anti-Injunction Act, banning of the closed shop, statutes compelling unions to abide by their contracts, a prohibition on walkouts illegal under bargaining contracts, and on any picketing in such situations, prohibition of mass picketing, and of picketing at any time involving injury or threat to workers, and forbidding of union coercion on workers.

The meeting approved the suggestion that machinery be set up under which grievance cases may be settled quickly and impartially. This, it was agreed, would be akin to arbitration, and might as a last resort justify labor courts of the sort which will be proposed in Congress.

Speaking at the evening meeting, Gen. Groves largely discussed the various, sometimes seemingly insurmountable obstacles which confronted the Manhattan District project as it went about developing the atomic bomb. Movies of the Bikini tests were shown.

Berna Tells of Problems

Mr. Berna dwelt in his talk on the problems created for the machine tool industry by the intensive wartime production, and made the point that builders were busy redesigning, to obsolete war and prewar machines. He noted the current labor problems, stressing that industry must tell its story to the public, and pointed out that optimism factors as well as pessimistic ones could be found in the current picture—such as heavy deferred requirements for public works, and for goods of all sorts.

Mr. Berna estimated that 620,000 machine tools were left today in RFC and WAA hands, of which 309,000 or so might remain after industry completes its buying of available equipment.

Despite this surplus overhanging the market—equivalent to 10 years of prewar machine tool production—Mr. Berna said that his industry now has a backlog of $175,000,000, and is shipping at a rate of $25,000,000 per month. About 22% of production is being sent abroad, he said, and some 25% of incoming orders are of foreign origin, indicating the worldwide demand for production machinery.

Goddard Reelected

E. A. Goddard, president, Goddard & Goddard Co., Detroit, was re-elected president. D. E. Van Deusen of Kelly Reamer Co., Cleveland, was named vice-president, and R. H. Wolfe, Arrow Tool & Reamer Co., Detroit, was re-elected treasurer. Harry J. Merrick will continue as executive secretary.

The membership elected four directors for 3-year terms. Re-elected were Mr. Goddard, Emil Gairing of Gairing Tool Co., Detroit, and Malcolm F. Judkins of Firth-Stirling Steel Co., McKeesport, Pa. Mr. Van Deusen was the fourth man named for the 3-year term. John K. Penny, U. S. Broach Co., Detroit, was elected to fill a vacancy in an unexpired term.

Matched Stroke—Duffers lose one more alibi as it becomes possible to match golf irons within 1/16 oz. Vertical two-pass broaching slices out eight sets of forging dies and hand snagging of heads at MacGregor-Goldsmith, Inc., using the same blank and machine with different fixtures for each number of iron. Here F. V. Geier of Cincinnati Milling Machine, who supplied the broach, broaches the idea to Byron Nelson, while Henry Cowen (right), president of MacGregor, looks on

Washington Bulletin

Three Bid on Steel Plant

Chicago Industrial Engineers bid $33,000,000—$5,000,000 cash and balance in 12 years at 4%, for government's second largest wartime steel plant: the $91,000,000 Republic Steel plant at South Chicago. Central Steel Tube Company, Clinton, Ia., bid $20,000,000 cash. Republic Steel, wartime operator of the plant and present holder of an interim lease, made three proposals: (1) $5,000,000 cash and $1,500,000 per year for 20 years for a total of $35,000,000; (2) $27,000,000 cash; (3) 10-year lease with 5-year options for a maximum of 25 years with rentals based on production.

Informed speculation is that WAA will award the plant to Republic. The Company presented figures showing it now produces 8.5% of ingot steel in the U. S. and with the Chicago plant would produce no more than 11%. This percentage probably will not cause Justice Department to rule Republic out on ground of monopoly. WAA spokesmen said award of the Carnegie plant to U. S. Steel months ago ran the Company's percentage of U. S. total up to 37%.

WAA's real property disposal office will act on the bids early in 1947. The plant occupies 160 acres and nearly 60 buildings. Its capacity is 750,000 tons of electric furnace steel ingots per year, produced in 9 70-ton furnaces.

GE Construction Approved

Additional construction valued at nearly $12 million on the Turbine generator plant of General Electric at Schenectady has been authorized by Civilian Production Administration. Added facilities, which will take 21 months to build, will provide for more production of large turbine generator sets, magnet wire manufacturing equipment; power, ordnance, and searchlight equipment for armed forces. Cost of the job will be $18,189,000, including over $6,000,000 for equipment.

Apprentice Training Tools

Surplus hand tools, including bits, tool boxes, calipers, chisels, dividers, drills, files, gages, etc., valued at $1.5 million, have been transferred by WAA to Veterans Administration for apprentice training. This is part of WAA's program of donating surplus to education institutions.

CPA Uses Coal Strike

CPA used the 16-day coal mine stoppage as a convenient reason for halting priorities on iron and steel. Actually, the agency was forced by growing pressure against wartime controls.

Parallel steps, taken for the same reason, were a cutback on merchant pigiron preference ratings for December delivery, premission to steel warehouses to reject all steel orders, whether rated or not, calling for more than 10,000 pounds in any one classification (sheets, bars, etc.) where the orders would impair distribution, and establishment of a ceiling of 25% of production on rated orders which steel mills must honor after Dec. 31. The iron and steel orders were effective Dec. 9, and the pig iron order immediately, Dec. 6.

Surplus Metals Loosening

W. H. Kelly, chief Metal Sales Division of WAA, anticipates that 75% of government-owned surplus steel and non-ferrous metals will become available within 60 days. Kelly recently conducted a meeting of the Surplus Usable Steel Industry Advisory Committee which recommended (1) that WAA shorten its surplus metals procedures to make inventories available more rapidly and (2) that CPA allocate 50% of surplus metals for disposal to established steel warehouses for normal distribution to small manufacturers.

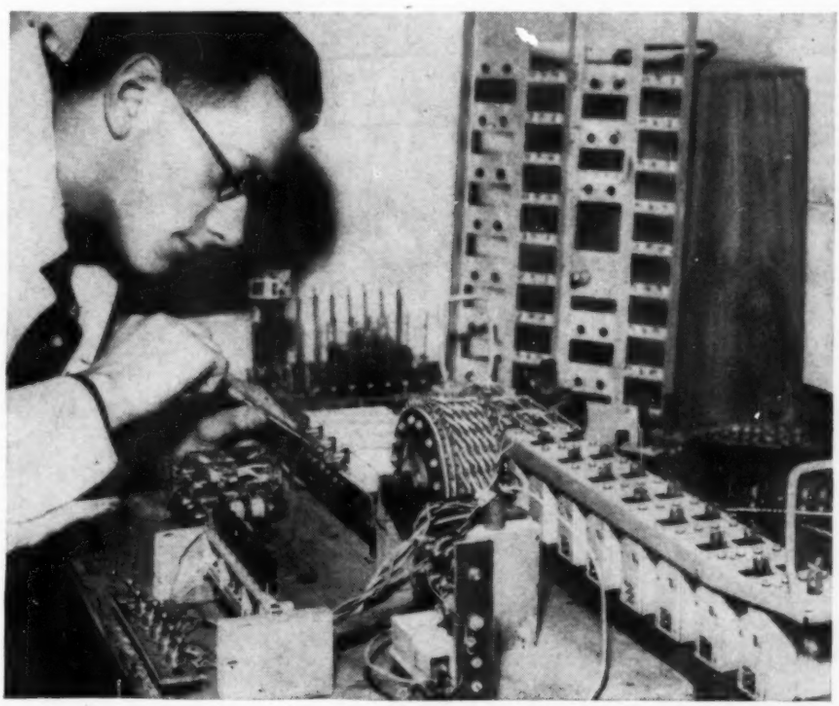
Technical Reports Released

A large number of technical reports, withheld for security during the war, are being released by National Advisory Committee for Aeronautics. Much of NACA's work in that period dealt with conventional aerodynamics and reciprocating engine-propeller problems, and is increasingly obsolescent. Present projects are jets, rockets, fuels for same, and supersonic wing design. These make interesting reading.

Labor Dep't. Reorganized

Secretary of Labor Schwellenbach made a drastic reorganization of the Labor Department's top staff, and created a staff committee on program and policy. Under Secretary Keen Johnson has been assigned specific administrative duties, and departmental responsibilities have been given to three Assistant Secretaries, John W. Gibson, Philip Hannah, and David A. Morse.

The move is designed to complete integration of the Department. It will tend to tie together the many activities of the different bureaus to make their services more available and more useful to labor, management and the public.



British Memory Machine—Four British scientists are collaborating on this artificial brain, which will surpass, in many ways, the capabilities of the human mind. Called the Ace, it will solve in a split second mathematical problems that it would take the human mind weeks to answer. It will cost $400,000 and use 18,000 valves and 5,000 switches

CIO Plans Flexible Wage Pattern; Industry-Wide Strike Threats Fade

NEW YORK—Changed CIO wage strategy indicated at the mid-December conference of officials of three major unions may give management a real opportunity to negotiate 1947 labor peace.

Likelihood of a new series of major industry-wide strikes has diminished, for the moment at least. Strikes will come in basic industry, and will have their usual crippling effect in a widening circle of diversified plants, but it now appears they will be corporation-wide only. Present plans, call for no repetition of, for instance, last year's steel strike which hit all plants—production and fabricating—at once.

Flexibility is the dominant characteristic of CIO's current wage program. The union objective is to get the maximum pay boost possible without strikes. Walkouts are a part of present strategy only if individual CIO unions are unable to obtain "adequate" raise offers from employers.

'Adequate' Demand Sought

Initial meetings of the CIO's United Electrical, Radio & Machine Workers and United Steelworkers did not set a definite wage demand to be advanced as "adequate." The United Automobile, Aircraft & Agricultural Implements Workers announced it will demand a 23¢ an hr. increase and adjustments to make a total wage raise of about 30¢ an hr. Even that demand position was hedged somewhat.

It was quickly obvious that CIO's top leadership, representing in the three unions more than 2,000,000 workers, one-third of CIO's total, was scrapping the idea of a national wage pattern. That plan, in part at least, fostered in 1946 by the government which backed 18¢ hourly wage increases, has been blamed for prolonging many strikes. Wage increases which could be accepted by some branches of management, were impractical for others. Insistence on a no-compromise position by the unions led to long and bitter tieups.

Narrowed Negotiations Seen

This year, CIO expects to negotiate contracts on an industry-by-industry basis. Different wage figures may even be set inside industries, to conform with the ability of small employers to pay higher labor costs.

Although there can be no definite figure yet on what unions will settle for, management can expect it to be right around 15¢ an hr. The unions will ask for more, and base their stand on the Robert Nathan report — prepared for CIO — which said that management can and should pay 25% higher wages without raising prices. But such a demand will come as a bargaining point. Unions can be expected to settle for less.

Union Treasuries Deflated

Strategy — and present flexible wage demands—can change suddenly and sharply, however.

CIO's position recognizes the temper of the public and the new Congress, neither of which can now be expected to take new strikes gracefully. It recognizes, too, that union treasuries are in a poor position to withstand the heavy drain of big-scale walkouts. UAW, for instance, has on hand only about $400,000 as compared with about $1,500,000 a year ago. While that does not include special strike funds in treasuries of UAW's local unions, it does have a strong deterring influence on plans for economic warfare in 1947. Other union treasuries are deflated.

Workers' Savings at Ebb

So are the cash reserves—and War Bond savings—of the workers themselves. Last year the average General Motors worker had about $600 in savings to back up the long strike against the company. Electrical workers were also fortified against payless weeks in walkouts against General Electric and Westinghouse. Now, however, savings have dwindled or been wiped out.

Still workers are willing to strike, and will demand strike action if necessary to force wages up.

Their union leaders are fully conscious of this. While they counsel moderation and stress confidence that negotiations can bring wage gains without strikes, they realize that union politics might force adoption of the strike weapon if members show dissatisfaction over progress. Such turn-abouts in policy have been forced before; they can be forced again.

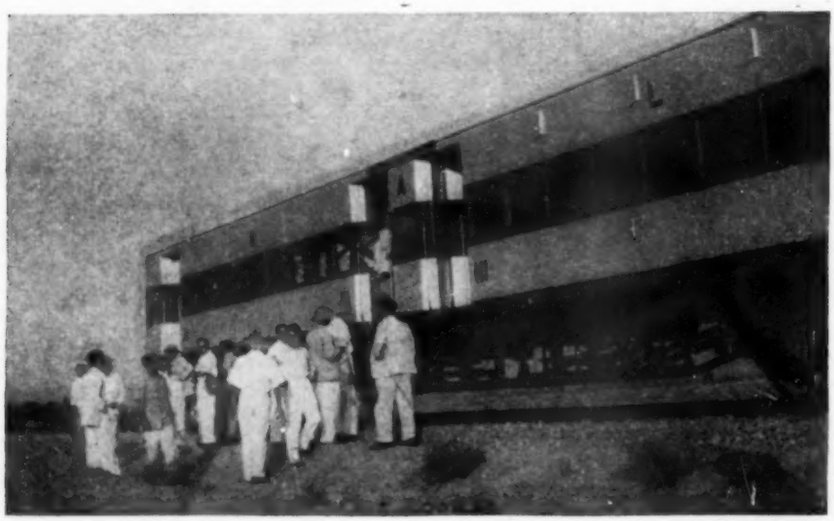
Quick Shift Possible

A quick shift can come, too, if prices go up—or, as is unlikely, go down. Further rises, which will pinch workers tighter, will create more pressure for higher settlements. Passage of stringent labor control laws by Congress might also force a shift in union policy—CIO groups uniformly will challenge, for instance, any legislation aimed at curbing strikes. Thus, measures which seek to insure labor peace may, in fact, serve as a bar to that peace.

AFL Action Watched

Other factors, too, may change CIO's present policy. If AFL unions settle for some pattern wage increase, CIO of necessity will demand that much, or more. And there is always a possibility that some branch of management, intent on buying labor peace and competitive advantage, will bid high and start a general wage movement.

So far, management spokesmen generally have centered their attacks on the Nathan report. They have denied strongly that a 25% wage increase can be given, without a corresponding—and inflationary—increase in prices.



Indian Experimental Railway Coach—Constructed of light sheet steel and fabricated on airplane principles, this experimental 3rd class railway coach was built at the Indian government's Hindustan Aircraft Factory at Bangalore and recently underwent "breakdown tests." The car weighs 35 tons, 7 less than the coach now in use, and provides roomier accommodations, including sleeping space for 54 out of 94 passengers

Army-Navy Hopes New Legislation Will Permit Negotiated Contracts

WASHINGTON—War jolted Army and Navy into contract negotiations—and now both want to keep it. They are supported in this aim by a new school of buying, trained in six years of war, which now dominates military procurement, and influences postwar industry.

The armed forces are about six times bigger than prewar and as customers of industry they've got about $6 to spend now, against $1 then. As the free market returns, more big and little businessmen will knock on federal doors for orders. Meanwhile, they hear news of changes to come:

1. Flexible wartime procurement laws are among about 500 Presidential war powers which Republicans promised summarily to abolish—and they might.

2. Sellers' problems will be eased by more coordination in Army-Navy purchasing, under hoped-for identical legislation.

3. Federal agencies, instructed by the President last August, are resisting inflation: they do without stuff because it costs too much, and they are pricing closer than ever.

System Liberalized in 1941

The present procurement system hinges on the First War Powers Act of 1941, in which Congress authorized the President to let agencies write hurry-up contracts "without regard" to previous laws—excepting specifically the iniquitous cost-plus-a-percentage-of-cost form of 1917, and the profit-limiting law.

This War Powers Act abrogated, for Army and Navy, a score of old procurement statutes, of which the kingpin was 3709, requiring that all purchases be awarded to the low bidder after formal advertisement. In addition to advertising and bidding (later restricted by WPB) the act authorized negotiation, fixed-price-incentive, cost-plus-fee, letters of intent, modifying clauses, and other shortcuts to quick action.

Army and Navy agree that these purchase devices are flexible, efficient, economical; and they have sent to Congress a joint bill calling for permanent procedures along these lines.

Procurement Revision Likely

Congress undoubtedly will go at least part way on revision of procurement. It could, however, first abolish the present system along with other executive war powers, forcing upon the services an interim of operation under the old rules, which, both Army and Navy say, would stop much of their procurement cold.

First to defend the war procurement rules against abolition is Rep. Earl R. Lewis of Ohio, chairman of a GOP committee studying repeal of the war powers. Lewis takes a walk tangent to the previous party line and says only 46 minor powers can be erased right now. And he adds that repeal of the war powers would force the armed forces back to unwieldy procurement practices, back to old staff organization, back to recruiting, and would break secrecy on defense patents.

The joint procurement bill, which had no hearings and must start fresh in the 80th Congress, calls for continued purchase by advertising. But important exceptions would permit agency heads to negotiate contracts for the purpose of keeping plants, mines, or other facilities in business and available for emergency. They could also negotiate contracts for experimental work. In other words, any firm, big or small, which has demonstrated excellence of an idea, process, or special skill, but on which advertising is not feasible, would be eligible to get a negotiated contract.

Benefits Small Firms

Under the bill, contracts would be negotiated if cost would be less, or if desired quality couldn't be obtained by advertising. In cost-plus-fee contracts, the fee would not exceed 10%, or 15% for development work. Virtually all development contracts are now, and would be under the bill, negotiated. Advance payment, as high as full value, would be authorized on good security.

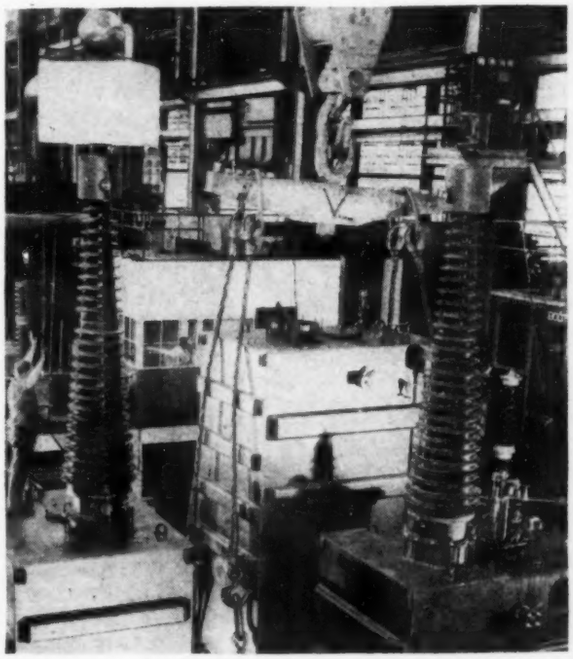
Placement of a "fair portion" of orders with small concerns is stipulated in the bill. Both Army and Navy are agreeable to small orders, which give more people a chance to learn war production. While some procurement officials say that small orders cost the government more per unit than big ones, small concerns, often with country labor, can produce many items for less than big companies can.

German Powdered Metallurgy Plant Removed to Stevens

HOBOKEN, N. J.—An entire German plant, engaged during the war in manufacturing hard cemented carbides, will be set up in a special building at Stevens Institute of Technology. The plant will be used in a Navy-sponsored research program on high-temperature alloys, important in development of jet-propelled aircraft and rockets.

One of the few complete plants removed from Germany by the U. S., the plant includes 12 pieces of machinery: mammoth presses and heating equipment.

George J. Comstock, professor of powdered metallurgy and director of research at Stevens powder metallurgy laboratory, said the Germans used more powdered metals during the war than all other countries combined. He described the German equipment as offering a fine set of tools for the development of new alloys by new techniques.



Long Distance Transmission—Electric Power may soon be transmitted at longer distances and at greater voltages than ever before attempted if the three transformers shown here in Westinghouse Electric Corporation's test pit live up to expectations. Built to step up electric current to as much as 500,000 volts, nearly 75% greater voltage than that now carried by any transmission lines, the transformers are each 37 ft. high and provided with extra heavy insulation to withstand the as-yet untried transmission voltages

Foreign Report

BASED UPON REPORTS FROM THE MCGRAW-HILL WORLD NEWS BUREAU

Machine Tool Disposal Problem Difficult for Australian Agency

MELBOURNE, AUSTRALIA—The wartime rise and postwar fall of machine tool production in Australia leaves the Directorate of Machine Tools of the Department of Munitions with this perplexing task ahead —how to dispose of the machine tools of 1939 to 1945 vintage with the greatest benefit for both the country's economy and security.

In 1939, there was less than half-a-dozen firms in Australia which could be regarded as machine tool manufacturers, and only two of these produced units comparable with foreign makers. At the peak of war production, there were 200 firms producing machine tools or parts, employing 12,000 operatives for an annual production of 14,000 units.

Wartime Installations

During the war, about 55,000 machine tools, furnaces and other ancillary equipment items of both domestic and foreign makes were placed in commission, in addition to 40,000 already in possession of industry when war broke out. Of this total, about 22,000 were delivered to commercial firms and privately operated munitions annexes, while the balance went to government agencies including the Army, Navy and Air Force.

The number included about 6,000 American-made units furnished under Lend-Lease and 1,000 units bought outside Lend-Lease. Wartime imports from England reached 5,000 units, and 67 lathes and planers came from Japan between 1939 and 1941. The balance of 40,000-odd units was Australian made.

Part Returned to U .S.

Part of these units were returned to U. S. forces in Australia under Reciprocal Lend-Lease. American establishments used 280 lathes, 904 drills, 645 grinders, 78 millers, or a total of 4,837 units representing a value of £770,000. These figures do not cover tools, gages, jigs and fixtures which in 1939 were produced only in the Government factory toolrooms and by three private firms.

Production of all items with the exception of ball-bearings ceased abruptly after Aug. 15, 1945. Not one firm today is producing machine tools, and output of attachments and accessories has shriveled into insignificance.

The Direcorate of Machine Tools is responsible for disposing of most of the 50,000-odd machine tools placed in service during the war, and also acts as selling agent for the Commonwealth Disposals Commission which is the authority in charge of surplus disposals.

Depreciation Rates

Terms fixed by CDC rule out a fire sale. Depreciation allowances are somewhat more liberal than in the U. S. and England: a sliding scale is provided which reduces value of a machine after three years' use of 45% of original cost.

The same scale applies for taxation purposes. But the original cost appears highly inflated by present standards. Depreciation is not calculated from net cost but is based on an imaginary purchase price which includes sales tax and, in the case of imported tools, customs duty plus sales tax. A concession is made on American tools, which are valued at 85% even if new. Authorized dealers are offered a discount of 28½% off valued selling price.

There are a number of complicating factors which have held up actual disposals on any scale and promise to keep the Directorate busy for years to come.

Disposal Policies Awaited

There is obviously some uncertainty as to what to do with a large number of single-purpose tools which have no utility value under present conditions. Are they to be retained as stand-bys by government arsenals or to be offered for what they may be worth to the highest bidder? These are questions of policy which have not yet been decided.

In the long run, Australia's defense interests may be served better by retention of a measure of reproductive capacity for machine tools. The present state of suspended animation in the machine tool building industry is not likely to be changed by offers of equipment, even at bargain prices.

There will have to be some assurance that the government is planning no radical departure from its tariff policy on capital equipment. That very policy has come in for violent criticism lately, not because it offers too little protection to domestic equipment makers but because the fast-growing automobile industry wants to tool up with duty-free imported equipment.

Machine Tool Production In Great Britain

Year	**$ Value
1924	14,028,000
1930	19,504,000
1934	18,548,000
1935	25,124,000
1936	37,388,000
1937	33,808,000
1938	53,200,000
1939	76,200,000
1940	116,800,000
1941	121,800,000
1942	134,172,000
1943	125,232,000
1944	103,056,000
1945	83,184,000
*1946	94,560,000

*Based on monthly average for seven months
**Based on $4 rate of exchange for British pound.
Source: British Ministry of Supply

British Machine Tools

LONDON—The machine tool industries of Great Britain reach all-time production records during the past decade. Demands of mechanized warfare was largely responsible for tremendous expansion in the manufacture of machine tools and other production equipment.

Prior to the war, British machine tool industry employed about 21,000 workers in fewer than 150 plants. In 1935, British builders shipped about $26,124,000, and the following year it increased to $37,388,000

During the war, British machine tool production soared to more than $134,172,000 in 1942. Production for 1946 is estimated at about $92,000,000. Early in 1946, the British Ministry of Supply reported that of some 460,000 new machines installed during war years, no less than 380,000, or 82%, were made in Britain.

British Surplus Disposals

Month	**$ Value	Number
1945 up to June 30	*5,309,024	*4,249
July	1,652,152	1,517
August	1,391,360	1,499
Sept.	2,186,000	2,494
Oct.	3,129,300	2,862
Nov.	2,544,488	2,186
Dec.	4,238,036	3,301
1946		
Jan.	3,834,692	3,676
Feb.	4,059,592	3,538
March	5,931,220	5,795
April	5,592,744	7,043
May	8,068,444	6,412
June	7,531,524	6,050
July	6,279,664	5,692
TOTAL	61,748,240	56,514

*Approximate figures
**Based on $4 rate for exchange for British pound.

Names in the News

James H. Marks

John C. Campbell

James H. Marks, executive vice president of Packard Motor Car Co., Detroit, has resigned. He has been affiliated with Packard since 1916 when he was named plant engineer. **George H. Brodie,** former assistant to the president and general manager, will succeed Mr. Marks.

John C. Campbell has been named manager of industrial engine sales for the Detroit Diesel Engine Div., General Motors Corp., Detroit.

DeAlton J. Ridings has been elected president of the Porter-Cable Machine Co., Syracuse, N. Y., succeeding his father, the late **Walter A. Ridings. Lloyd B. Benham,** factory manager and treasurer, has become vice president.

Thomas A. Farrell has been named vice president of the newly formed Dearborn Motors Corp., Dearborn, Mich. He was formerly general sales manager for the Kelvinator Div., Nash-Kelvinator Corp.

Carl L. Zak, former assistant sales manager, has been appointed general sales manager of the Pittsburgh Steel Co.

Donald W. Hornbeck has resigned as president of the National Bronze & Aluminum Co., Cleveland. He will be succeeded by **William I. Neimeyer,** vice president in charge of operations for the past two years.

Ralph M. Heintz, vice president in charge of engineering of Jack & Heintz Precision Industries, Cleveland, will temporarily take charge of all production for the company.

Dr. C. Earl Webb has been appointed chief engineer of American Bridge Co., succeeding **Dr. Charles F. Goodrich,** who retired after 40 years with the concern.

Leopold DiFiore has been named chief engineer of the Portsmouth Steel Corp.

James N. Crawford, sales manager, and **W. R. Teller,** director of engineering and development, have been named vice presidents of Bryant Heater Co., Cleveland.

Gilbert E. Collyer has been appointed district manager of the Detroit office of H. K. Porter Co., Inc., Pittsburgh.

L. W. Mason has been appointed manager of the Pittsburgh sales office of National Tube Co.

R. L. VanCleve has been named director of purchases for Carnegie-Illinois Steel Corp.

Lee Treese, former production superintendent of the Ford Motor Co., has been appointed vice president in charge of manufacturing for the Tucker Corp., Chicago.

Alfred E. Stacey, Jr., one of the founders of Carrier Corp., Syracuse, N. Y., has rejoined the organization as a process consultant to the sales division.

R. M. Ellis, chief mechanical engineer of Hungerford Plastics Corp., Murray Hill, N. J., has been elected vice president.

John G. Fritzinger has been appointed district sales manager of the Philadelphia office of the Carborundum Co., Niagara Falls, N. Y.

R. C. Todd, former assistant vice president, **G. F. Albrandt,** former sales manager and assistant vice president, and **Dr. Anson Hayes,** former director of research, have been elected vice presidents of The American Rolling Mill Co., Middletown, Ohio.

Eugene W. Fuller has been named division manager of Shakeproof, Inc., a division of Illinois Tool Works. also, **B. F. Bales** was named Shakeproof sales manager and **John B. O'Connor,** chief engineer.

John J. Wild has been appointed sales manager of the Potter Instrument Co., Flushing, N. Y.

Edmund Pfeifer has been named sales representative in the Erie, Pa. area for Lukens Steel Co. and its subsidiaries.

George H. Powers has been appointed Boron Carbide Engineer by the Norton Co., Worcester, Mass., in New England, New York, Philadelphia and Pittsburgh area.

Harry B. Coen has been elected a vice president of General Motors Corp. He was formerly director of labor relations and last month was placed in charge of the company's employe cooperation staff.

W. C. Yates, assistant manager of General Electric Company's Industrial Divisions has retired after 48 years with the firm.

Floyd R. Carpenter has been appointed manager of the development division, Permanente Products Co., Oakland, Calif.

Dan J. Sheehan has been appointed manager of the Danville, Ill., plant of Hyster Co.

Hans A. Eggerss, executive vice president, has been elected president of Continental Can Co., Inc. He joined Continental in 1942 when they acquired The Container Co., Van Wert,, Ohio, of which Mr. Eggerss was president.

Leighton M. Harvey has been appointed sales engineer for the Metal Products Div., Ryan Aeronautical Co., with headquarters in Washington, D. C.

Gerhardt Bartz has been named works manager of the Bellevue Industrial Furnace Co., Detroit.

Leslie R. Taylor, former vice president and sales manager, has been elected president of the International Heater Co., Utica, N. Y. to succeed the late **Irving L. Jones. Murray Wheeler** has been elected vice president.

Abner B. Wellborn has been appointed superintendent of the Metallurgy Div., General Electric Chemical Dept., Pittsfield, Mass.

BUSINESS ITEMS

The newly created experimental section of the **Ford Motor Co.,** Dearborn, Mich., is headed by **William Burnett,** formerly associated with **Cadillac Motor Car Co.** for 17 years.

Commonwealth Engineering Co., Dayton, Ohio, will be moved to 137 N. Perry St., from 1771 Springfield St. Laboratories of the engineering company and its subsidiaries, **New Wrinkle, Inc.,** and **Chadeloid Corp.,** will be continued at 1771 Springfield St.

Rolled Thread Die Co. and **Reed Small Tool Works** of Worcester, Mass., have been consolidated and will go under the name **Reed Rolled Thread Die Co.**

Crucible Steel Company of America has opened a new warehouse at 4501-4531 West Cortland St., Chicago, Ill.

Monsanto Chemical Company's Plastics Division, Springfield, Mass., opened a Cincinnati sales office Jan. 1 with **Edward T. McBride** in charge as branch manager.

Hewitt-Robins Inc. offices are combined with **Robins Conveyor Division** at 7 South Dearborn St., Chicago, Ill.

A new combined service shop and warehouse in Baltimore, Md., and a new service shop and warehouse in Denver, Col., have been added to the **General Electric,** Schenectady, N. Y., network of apparatus repair and replacement facilities.

Link-Belt Co., Chicago, Ill., announces the opening of a sales office in Milwaukee, Wis., Century Bldg., at 808 N. Third St. **W. M. Hufnagel,** district sales manager, is in charge of the new office.

Reed-Prentice Corp., Worcester, Mass., has new sales and service facilities on the west coast at 2328 S. Santa Fe Ave., Los Angeles, Cal.

Denison Engineering Co., Columbus, Ohio, has appointed the **Pump Engineering Co.,** 1331 Third Ave., Bldg., Seattle, Wash., as its representative for the states of Washington, Oregon and part of Idaho.

The British Columbia Research Council has established an experimental foundry station to assist B. C. foundries solve problems which arise in the production of high quality castings. The foundry will be located at the Vancouver Technical School, Vancouver, B. C., with the Vancouver Board of School Trustees as co-sponsor.

West Coast Machine Works has opened a machine shop at Burde St., Port Alberni, B. C. **Ralph M. Stratford,** formerly with the **B. C. Electric Railway Co., Ltd.,** at Vancouver, is owner and manager of the business.

Ferro Foundry & Machine Co., Cleveland, Ohio, president; **John M. Price,** and a group of officers and members of the management group, purchased the plant and equipment from **Crispin Oglebay,** Cleveland. The name of the company has been changed to **Ferro Machine & Foundry, Inc.**

The Riley Gear Corp., Buffalo, N. Y., has been formed for the manufacture of industrial gears and machine parts. **Walter J. Riley** is president and treasurer.

Raymac Co., 3729 Cass Ave., Detroit, Mich., was formed in November to make and sell miniature carbide grinding wheels, reamers and burrs. Incorporators are **James McGuire, Richard L. Schmitt,** and **H. J. Hartkop, Jr.**

Consolidated Coppermines Corp., New York, has purchased a controlling interest in **The Titan Metal Mfg. Co.,** Bellefonte, Pa.

D. & S. Model Co. has moved from Dayton, Ohio, to 105-7 Robert St., Ludington, Mich.

OBITUARIES

William O'Neil

William O'Neil, 64, former president and general manager of the Dodge division of the Chrysler Corp., Detroit, Mich., died Dec. 15 at his home in Detroit. Retired since 1943, he also had been general manager of the Dodge-Chicago aircraft engine plant, which made engines for B-29 bombers. Mr. O'Neil started work as a tool and die apprentice and after 21 years of factory work, he became master mechanic for Chrysler Corp. in 1926. When Chrysler bought the Dodge Brothers business he was made president of the division.

Edward George Meckstroth, 58, vice president and general manager of Morris Machine Tool Co., Cincinnati, Ohio, died December 12. Mr. Meckstroth had served the company for the past thirty years.

Frederick R. Atkinson, 66, president and founder of the F. R. Atkinson Spring Co., Hamburg, N. Y., died Dec. 8 after a three months illness.

David FitzGerald, 51, manager of employee relations for the plastics division of the General Electric Co., Pittsfield, Mass., passed away at his home November 28. In 1940 Mr. FitzGerald was named assistant to the manager of the plastics divisions and in May of this year was made manager of employee relations.

Nathaniel A. Meloon, Sr., founder of the Meloon Die Cast Co., Syracuse, N. Y., and vice president and general manager of the former Buffalo Bronze Die Cast Co., Buffalo, N. Y., died Dec. 5.

Clyde G. Beebe, 46, sales engineer for Harvey-Whipple Co., Inc., Buffalo, N. Y., died Dec. 5. He had formerly been associated with Curtiss-Wright Corp.

David D. Lupton, president of David Lupton, Inc., Philadelphia, Pa., passed away recently at the age of 78. Formerly president of David Lupton's Sons Co., he formed the present firm with the suspension of that business in 1932.

Frank J. McHugh, retired official of E. I. du Pont de Nemours & Co., Wilmington, Del., and an Air Forces major during the war, died suddenly Dec. 1 at the age of 57. Mr. McHugh retired in 1936 after being connected with the corporation since 1910.

Charles D. Cooke, 81, retired president of the former Cooke Locomotive and Machine Co. founded by his father at Paterson, N. J., passed away Dec. 9. He was associated in the management of the locomotive works from the early 1900's until its absorption by the American Locomotive Co. 20 years ago.

Matthew Turnbull Davie, secretary-treasurer and director for the past 20 years of Burrard Drydock Ltd., North Vancouver, B. C., died at his home in North Vancouver recently. Associated with the company for 31 years, he was a well-known authority on shipbuilding methods.

MEETINGS

American Society for Testing Materials. Spring meeting and committee week. Benjamin Franklin Hotel, Philadelphia, Pa. Feb. 24-28. R. J. Painter, American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

American Society of Mechanical Engineers. Spring meeting. The Mayo Hotel, Tulsa, Okla. March 2-5. Ernest Hartford, assistant secretary, 29 W. 39 St., New York, N. Y.

National Materials Handling Exposition. Public Auditorium. Cleveland, Ohio. Jan. 14-17. Ezra W. Clark, chairman, P. O. Box 178, Battle Creek, Mich.

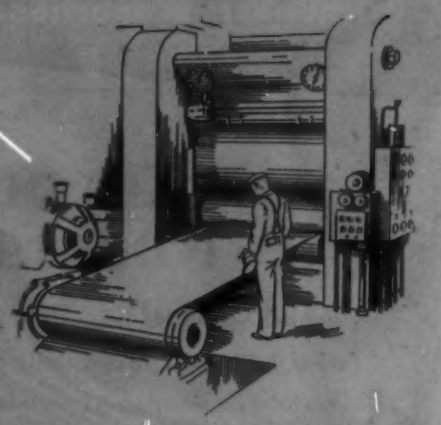
Society of Automotive Engineers. Annual meeting and engineering display. Book-Cadillac Hotel, Detroit, Mich. Jan. 6-10. John A. C. Warner, general manager, 29 W. 39 St., New York, N. Y.

Society of Plastics Engineers. National Plastics Show. Navy Pier, Chicago, Ill. Jan. 25-31. W. B. Hoey, executive secretary, 203 Theater Bldg., Birmingham, Mich.

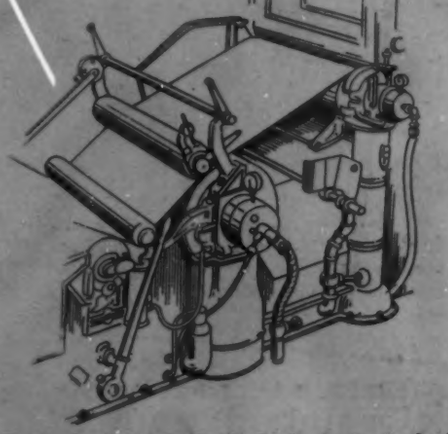
THE SHEFFIELD MEASURAY

MEASURES THICKNESS CONTINUOUSLY WITHOUT TOUCHING THE WORK

METALS
Sheet · Strip · Foil



RUBBER · PLASTICS
COATED FABRICS
FILMS · PAPER



Problems inherent in contact gaging of continuous strip materials are completely eliminated by the installation of the Sheffield Measuray. *No part of the Measuray touches the work.*

Whether it be hot or cold metal strip, or non-metallic materials, the Measuray provides amplification and sensitivity to check thickness to accuracies beyond any known industrial requirements.

The Measuray may be traversed across the moving sheet to obtain a check at any point, or an average check. It can be adapted to actuate an indicator, signal lights, or a recorder, singly or simultaneously.

A combination of X-Ray and electronics is used as the gaging principle to measure the mass—therefore temperature, weaving of the stock, speed of motion, and proximity of the gaging head to the work are relatively unimportant factors. The Measuray conforms to the safety standards of American Standards Association and National Bureau of Standards.

Write for complete information. Better yet, bring samples to Sheffield in Dayton and check them on the Measuray.

For an early installation (orders exceed production) see the Measuray in action and arrange for a Sheffield factory representative to visit your plant and draw up plans for your application.

Standard gages and measuring instruments shipped within 24 hours.

SHEFFIELD MASTER CRAFTSMEN

Real job security is provided only by plentiful incoming orders shipped at prices consumers can afford and want to pay . . . modern machines help make this possible.

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Dayton 1, Ohio, U.S.A.

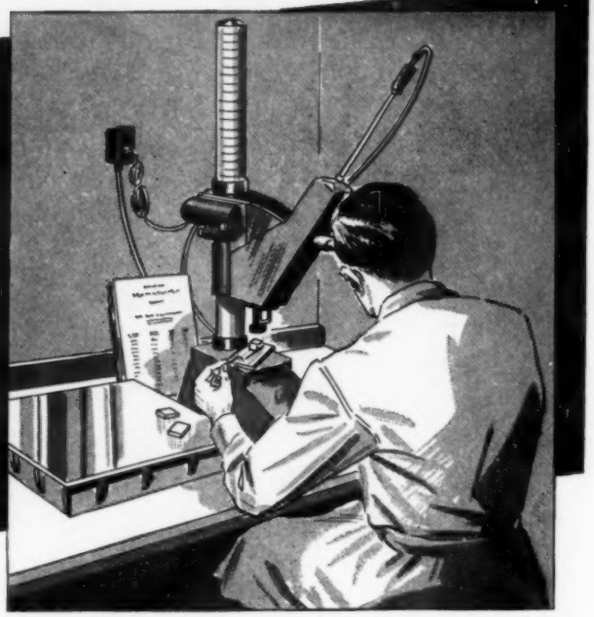
MACHINE TOOLS · GAGES · MEASURING INSTRUMENTS · CONTRACT SERVICES 2327

GAGE BLOCK INSPECTION SERVICE

$15.00

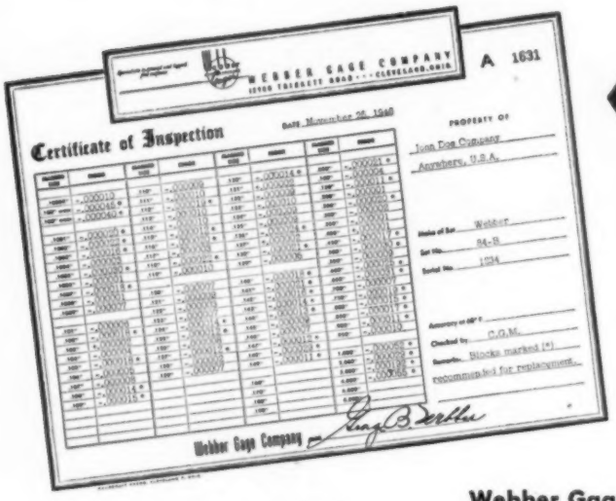
84 BLOCK SET

(Other sets proportionately low)



DON'T LET DOUBT CAUSE CONTROVERSY
. . . IT COSTS SO LITTLE TO BE SURE!

Webber opens its inspection facilities to all users of gage blocks regardless of make. The wear inflicted through daily use over a period of months is sufficiently great to warrant careful examination at periodic intervals. The absence of this precaution can cause controversy and production difficulties. Avoid trouble, send those gage blocks to Webber, now.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Certificate of Inspection
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YOUR CERTIFICATE OF ACCURACY

1. ***We will return the gage blocks with a Certificate of Inspection showing present size in comparison with master blocks CERTIFIED by the U. S. Bureau of Standards.***
2. ***Removal of burrs and nicks which impair accuracy.***
3. ***Identification of those blocks beyond repair—along with a recommendation for replacement.***

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WEBBER MAKES PRECISION GAGE BLOCKS EXCLUSIVELY

- ★ Gage Block Sets in Steps of .00005".
- ★ Individual Special Size Blocks.
- ★ Heavy Duty Gage Blocks.
- ★ Angle Gage Blocks in Steps of one second.
- ★ Carblox (Carbide) Wear Gages.

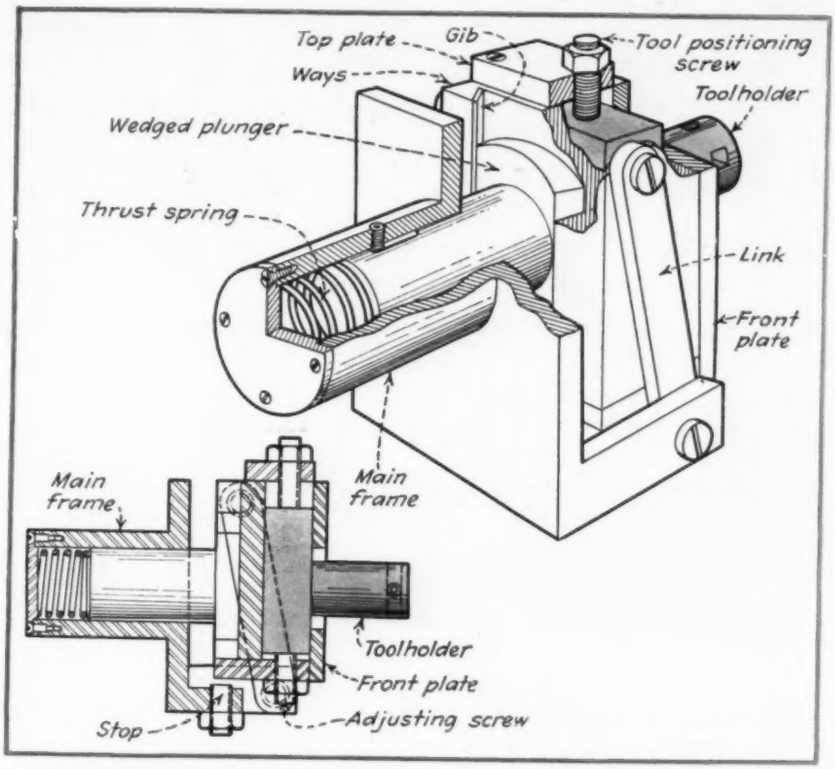
Webber
PRECISION GAGE BLOCKS

American Machinist REFERENCE BOOK SHEET

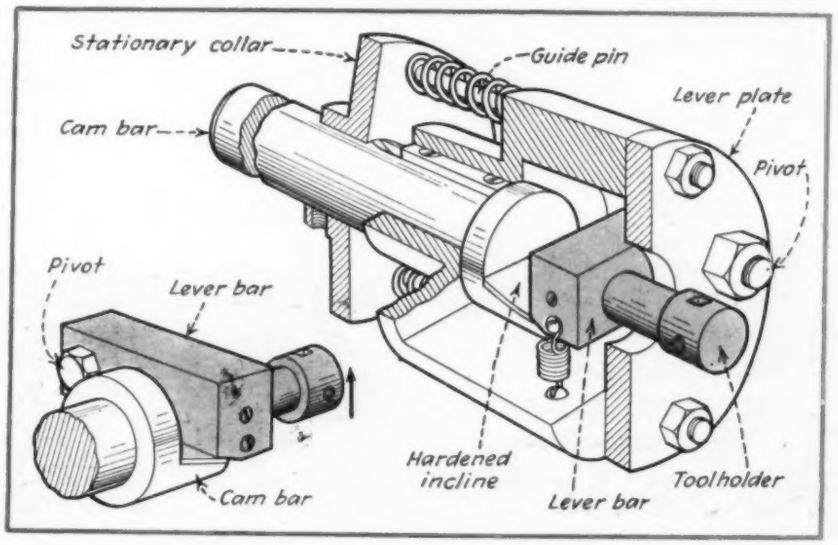
Recessing Tools for Turret Use...I

Five types of successful recessing tools, for light and heavy-duty applications, employ well-known principles of machine design

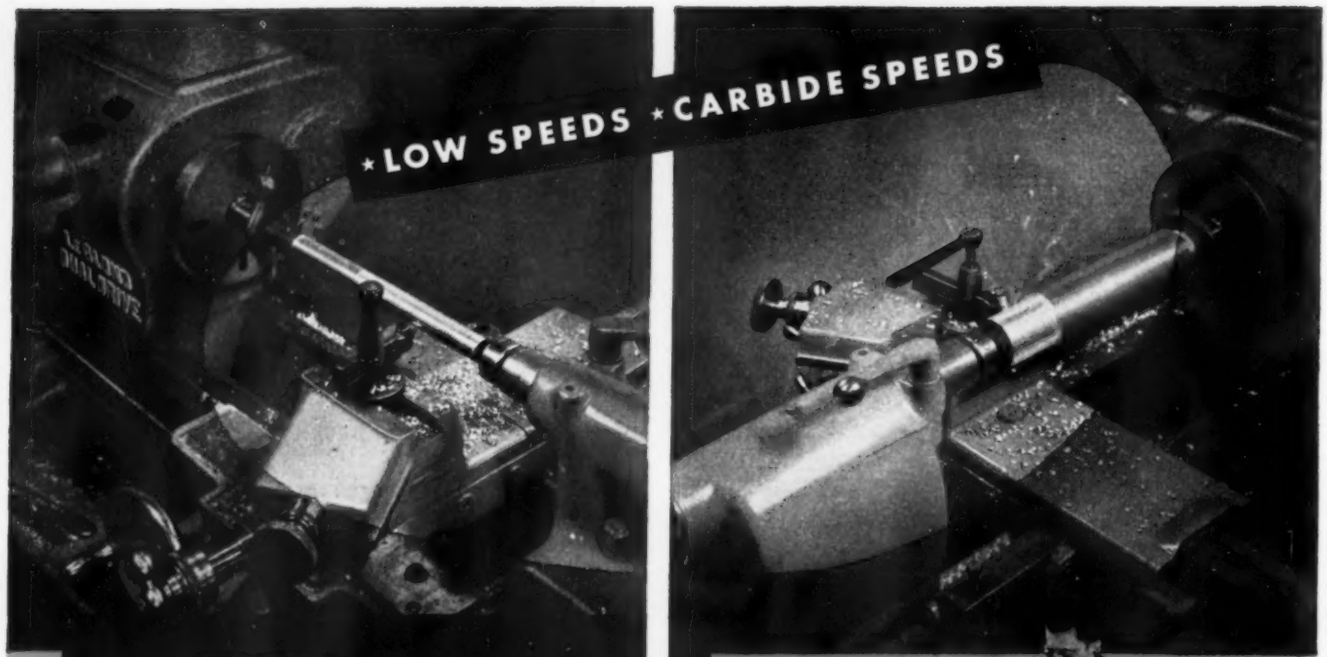
By
FLOYD W. MILLER
and
CARL A. NAMUR



Wedged Plunger. This type of recessing tool withstands heavy-duty, continuous operation, especially roughing cuts. Links at the sides of the tool create the recessing motion. When the front plate strikes the work, the links force the gibbed toolholder body and wedged plunger backward and at the same time cause the body to slide downward on the plunger. The tool-positioning screw and the stop aid in setting up the tool and controlling depth of cut

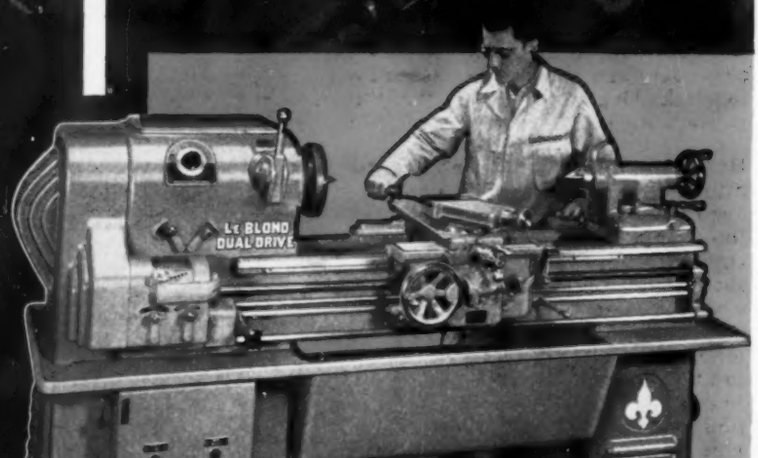


Inclined Plane and Lever. The cam bar is placed in the turret and the ram or carriage is fed forward until the lever plate comes into contact with the workpiece. Continued movement pushes the lever plate backward on the guide pins. This action causes the toolhead to pivot into the cut, being forced to do so by the inclined plane on the lever bar riding up onto the inclined face of the stationary cam bar. Sturdy and inexpensive, this tool is suitable for occasional use in the average small shop



get **BOTH** in the

NEW LeBLOND DUAL DRIVE!



Never before have two more useful and productive speed ranges been offered in one lathe . . . combined with generous swing capacity and center distance, and more-than-ample power to turn the wide range of operations possible on this remarkable new LeBlond lathe.

Twelve spindle speeds in two ranges (low: 28 to 445rpm; high: 540 to 1800 rpm) controlled by a single lever. Swing over ways 15″, distance between centers variable, main drive motor 3 hp.

The totally enclosed, automatically lubricated feed box, one-piece apron with positive jaw feed clutch, and one-shot lubrication to apron, carriage, and bed . . . are but a few of the many engineering advances offered on the new DUAL DRIVE. On display at our plant daily.

THE R. K. Le BLOND MACHINE TOOL CO., CINCINNATI 8, OHIO
LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES
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Your copy of Bulletin no.1

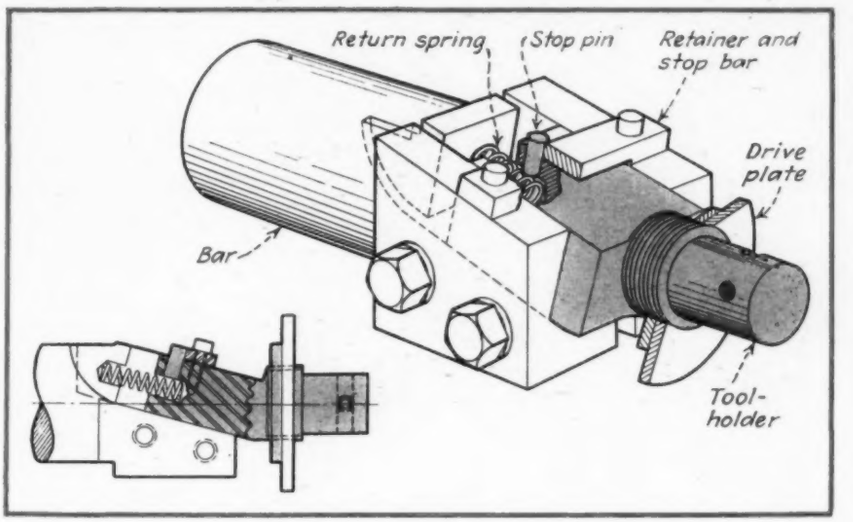
which describes the new DUAL DRIVE, may be obtained by addressing Dept. D-16.

LeBLOND

DUAL DRIVE COPYRIGHT 12-46

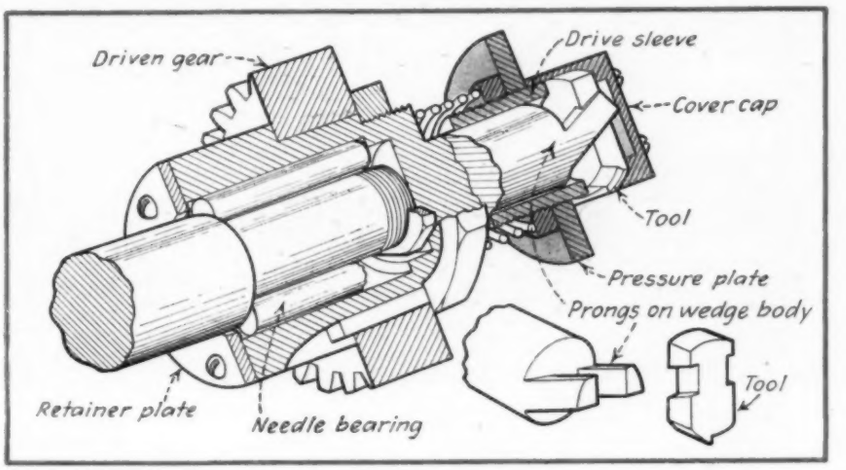
Recessing Tools for Turret Use...2

Inclined-Plane Tool. This simple tool, consisting of two main parts, should find frequent use in the small shop. Action of the tool is simple: when the drive plate contacts the work, the combination toolholder and slide is pushed up the inclined surface of the bar. The drive plate is always kept against the work by turret feed and the tool moves outward from the axis of the bar. When the tool is run back to the inoperative position, a stop pin strikes a stop bar and holds the assembly together. Depth of feed in this tool is controlled solely by turret feed.

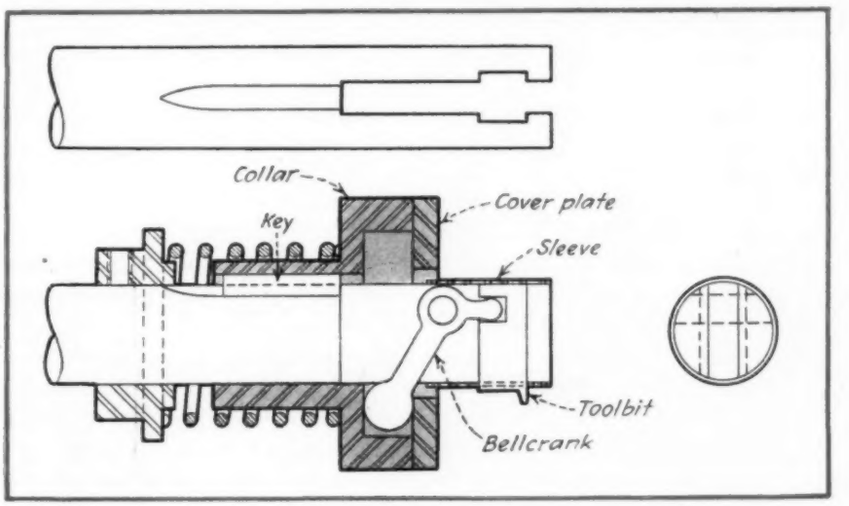


Hand-Operated Tool. Located at the fifth station of a Goss & deLeuuw 5-spindle chucking machine, this tool finishes the recess rough machined in the part by the first tool shown on a preceding page. The tool is driven by a gear concentric with the dead spindle, through a wide idler in mesh with a narrow gear located back of the tools on the fourth spindle. A crank-operated pinion and rack on the spindle enable the operator to advance the tool into the work. The wide idler gear allows the tool to be stopped in rear position and to rotate only when entering the work. Thus, the tool is stopped to protect the operator while removing or placing work in the chuck.

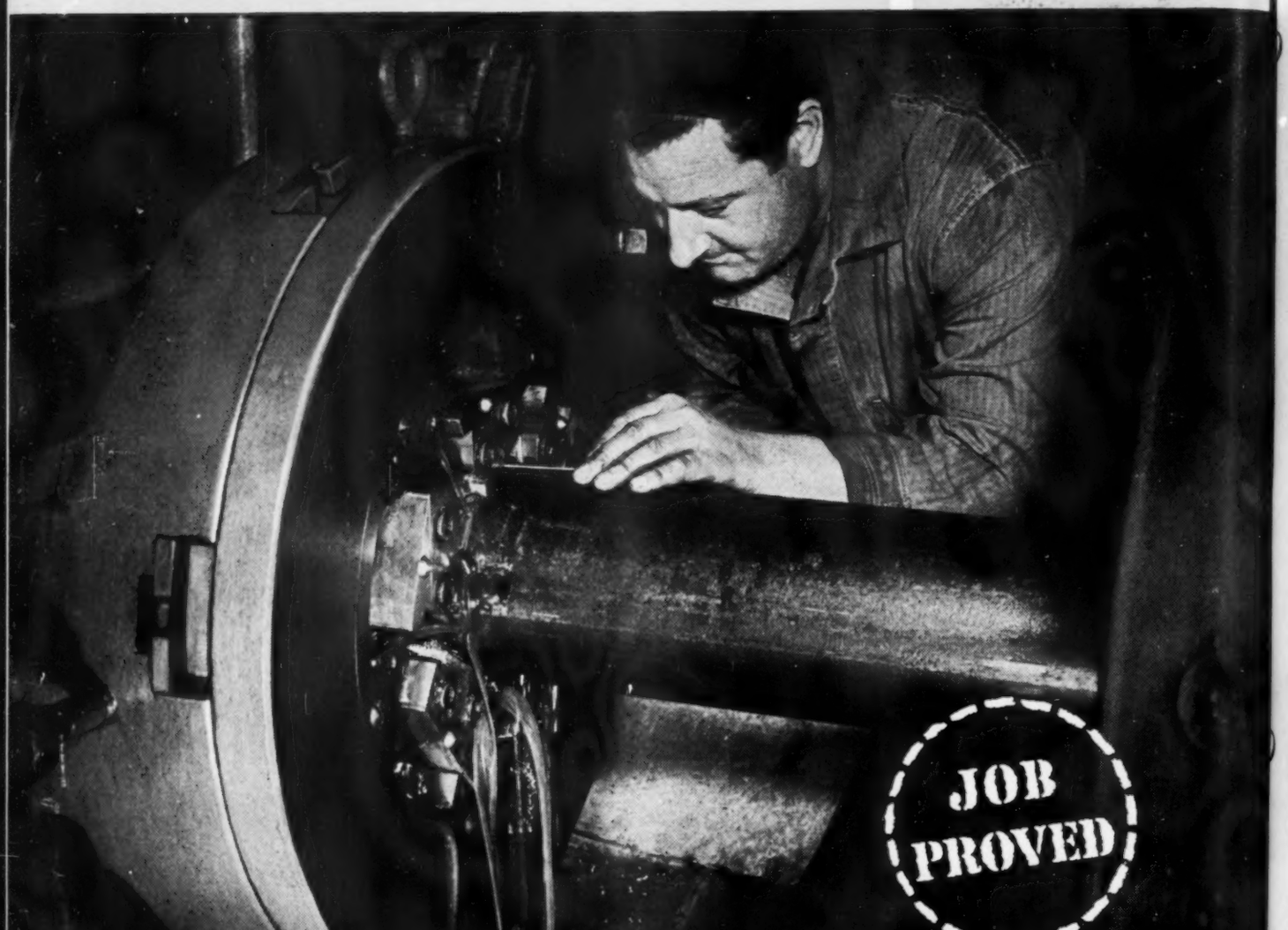
During recessing, the wedge body rotates freely on a needle bearing mounted on the dead spindle. At the front, the wedge body has two inclined prongs which act as guides as well as a means of "expanding" the tool. The tool looks somewhat like a flat form tool and has inclined guide slots milled in each side to engage the wedge-body prongs. By forcing the pressure plate against the work, the tool carried by the slot in the cover plate is forced to move backward in the wedge-body prongs and outward at the same time.



Bellcrank-Type. This light-duty tool cleans up back of the thread in a special 1-in. nut. When the cover plate strikes the work, the sliding collar is pushed backward against spring pressure and causes the large end of the bellcrank to rock upward. The small end of the bellcrank thereupon pushes out the toolbit. Chips are kept out of the mechanism by the sleeve, which also acts as a vertical stop for the toolbit.



Cutting Better Threads...Faster



SUNICUT 196...

Speeds Up Threading of Automatic Sprinkler Pipes, Improves Quality of Threads

Here is a case where a big manufacturer of automatic fire-sprinkler systems increased production and improved his threads by replacing a special, expensive oil with Sunicut 196.

Machine: No. 5 Landis Pipe-Threading Machine.
Operation: Threading ⅜" to 8" Pipe. **Lubricant:** Sunicut 196.

In this case, a saving of 15% in oil costs resulted. This is a typical example of how Sun's "Job-Proved" cutting oils have aided in speeding up production and in reducing costs.

Machine-tool operators prefer Sunicut because it is a clear, transparent, free-flowing, sulphurized mineral oil. Sunicut is recommended for those exacting jobs where an emulsifiable cutting oil is not suitable.

Other "Job-Proved" Sunicut grades are suitable for use on automatic lathes, gear-cutters, etc. Contact the nearest Sun office for recommendations.

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Cast-Iron Gear Blanks

AMERICAN GEAR MANUFACTURERS ASSOCIATION STANDARD 242.02, ISSUED SEPTEMBER, 1946

Section I—General

1. Purpose—(a) The purpose of this standard is to provide specifications for cast-iron materials having a range of properties suited to gearing applications and capable of being duplicated to produce uniform service performance for a given specification.

Section II—Classes of Materials

1. Classes—(a) Iron gear-blank castings shall be classified with respect to tensile strength, as follows:

Class	Minimum Tensile Strength psi.	Minimum Brinell Hardness on Toothed Portion
No. 20	20,000	...
No. 30	30,000	175
No. 35	35,000	185
No. 40	40,000	200
No. 50	50,000	215
No. 60	60,000	220

(b) For castings, for which assurance is required that the material conforms to the tensile properties of the specified class, tensile-test bars and tests shall be definitely specified on the inquiry and order.

(c) The minimum Brinell specification shall apply to all orders.

2. Material Manufacture

(a) Any commercially recognized melting method may be used for castings poured to this specification.

(b) No repair welding shall be done without the consent of the purchaser.

(c) There shall be no limitations as to chemical composition unless otherwise specified or agreed upon by purchaser and supplier. It is expected that the chemical analysis will be such as to provide substantially uniform properties in the toothed portion, be machinable and free from hard, chilled metal.

Section III—Heat-Treatment

1. Heat-treatment

(a) Castings covered by this specification are not required to be heat-treated unless:

(1) A heat-treatment is specified.

(2) The founding procedure or design of casting results in "internal stresses" which will cause distortion after machining. Such castings shall be given a suitable "stress-relieving" treatment to minimize internal stresses.

Note 1: Castings requiring the maximum in dimensional stability should be specified with a stress-relieving treatment. The following is recommended: "Castings shall be stress relieved at a minimum temperature of 900 F., being maintained at this temperature for a minimum of 1 hour per inch of section and furnace-cooled to minimize internal stresses at a rate not to exceed 50 F. per hour to a temperature of 200 F. or less.

(b) When test bars are specified, the bars shall be heat-treated in the same load as the castings represented. No heat-treatment shall be allowed after testing unless approved by the purchaser.

Section IV—Physical Property Tests

1. General

(a) The procedures for pouring test bars and testing shall conform to American Society for Testing Materials' Specifications for Gray Iron Castings A48-41. Either the tensile or transverse bar may be used.

2. Tests

(a) If the transverse bar is used, the transverse or flexure breaking loads shall conform to the values specified in Table I, below.

3. Controlling Section

(a) Unless otherwise specified, the controlling section shall be the cast thickness of the toothed portion.

(b) The following sizes of test bars shall be cast for a given controlling section:

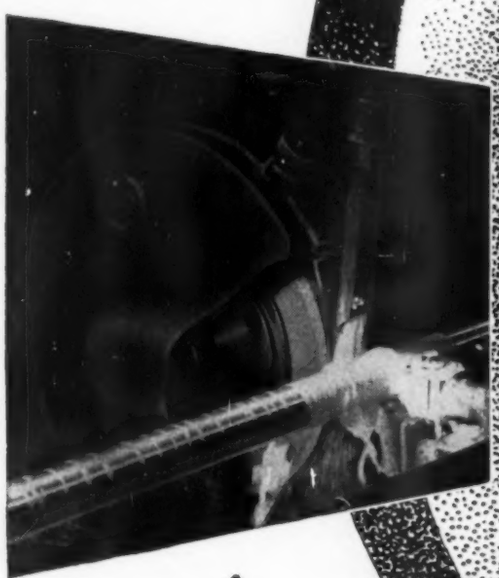
Controlling Section of Casting, in.	A.S.T.M. Transverse Test Bar	Nominal Diam. of Test Bar As Cast, In.
0.50 and under	A	0.875
0.51 to 1.00	B	1.200
1.01 to 2.00	C	2.000
2.01 to 5.00		See Note 2

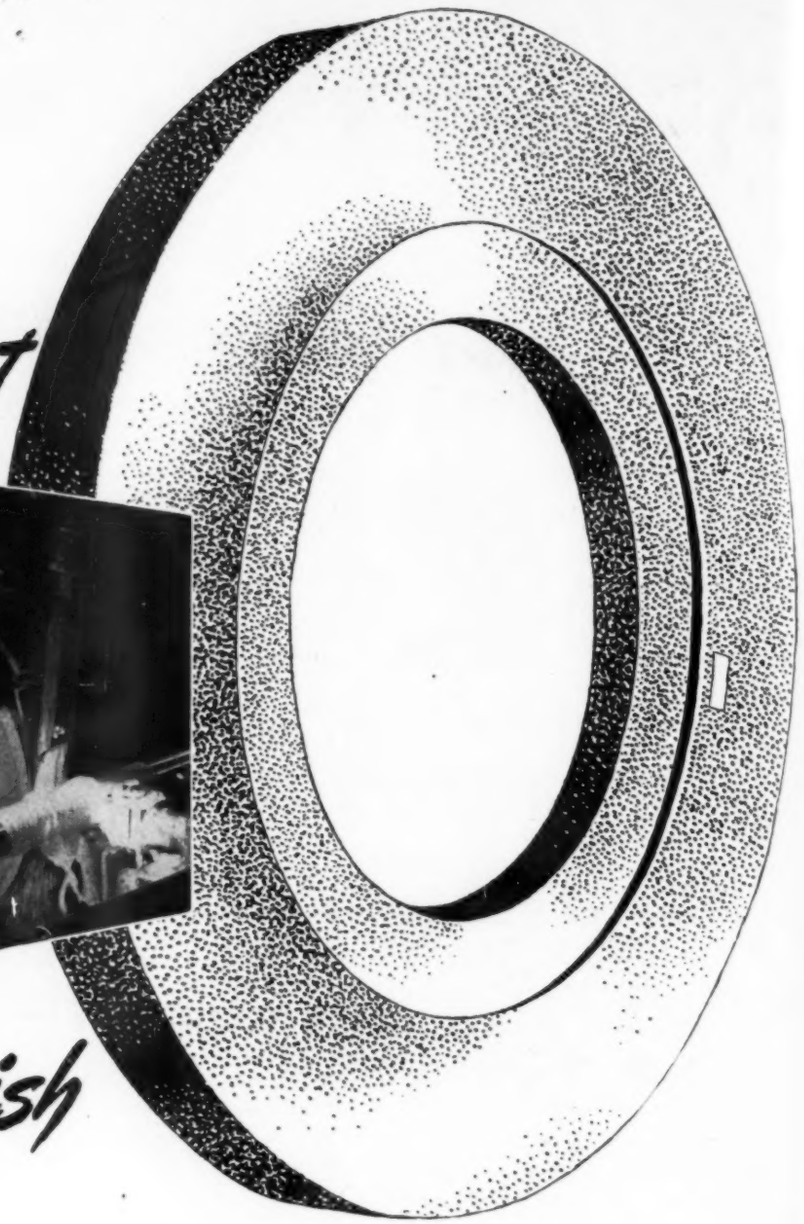
Note 2: Over 2.00 to 5.00: The type of bar to be used shall be the subject of agreement between manufacturer and purchaser. A recommended method is the use of Type C bar which shall show a tensile strength increase over the specified minimum by an amount equal to $2500 \times (T - 2)$ *where* T = *thickness of controlling section.*

TABLE 1—TRANSVERSE OR FLEXURE BREAKING LOADS

Transverse or flexure test bar—Span length	0.875 in. dia. 12-in. supports	1.2 in. in diameter 18-in. supports	2.0 in. dia. 24-in. supports
Class	Breaking Load at Center Minimum lb.	Breaking Load at Center Minimum lb.	Breaking Load at Center Minimum lb.
No. 20	900	1800	6000
No. 30	1150	2200	7600
No. 35	1275	2400	8300
No. 40	1400	2600	9100
No. 50	1675	3000	10300
No. 60	1925	3400	12500

Make a *selective start* for a *precision finish*





Selection of the right wheel is a must for low cost, top quality precision results in cylindrical grinding. Get off to the right start by selecting yours from Simonds Abrasive's complete line. Whether for traverse, plunge cut, form or centerless cylindrical work, you can select the right Simonds Abrasive wheel to produce superior finish within the closest tolerances. For lasting efficiency of action and fewer wheel dressings Borolon Vitrified Bonded wheels are especially recommended. Simonds Abrasive Data Book is packed with information to facilitate your selection of the right wheels for your particular jobs. Send for your copy today.

For assistance in requisitioning consult Simonds Abrasive Distributors located in all principal cities.

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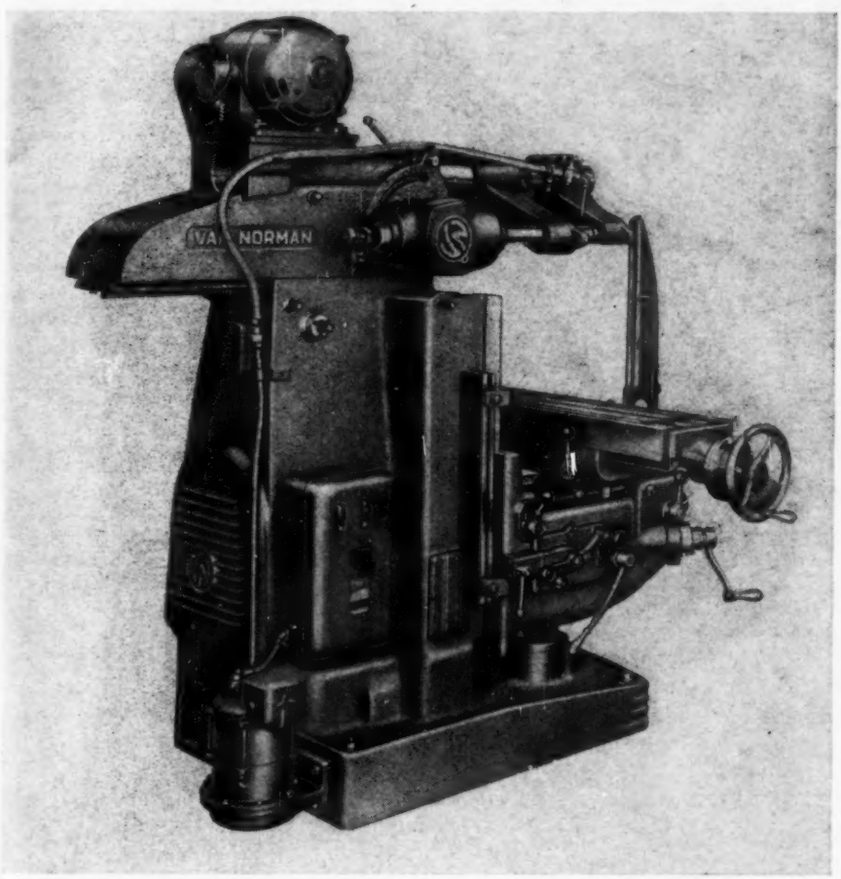
Shop Equipment News

Van Norman Ram-type Milling Machine Is Built with Universal Cutterhead



Van Norman No. 22M milling machine has an adjustable cutterhead to meet fluctuating milling requirements

The Van Norman Co., Springfield 7, Mass., has announced the No. 22M ram-type milling machine for use in pattern shops, toolrooms, tool and die shops, laboratories and machine shops.

Greater vertical range is provided by the higher column. It is possible to bring the table nearly up to the center line of the spindle.

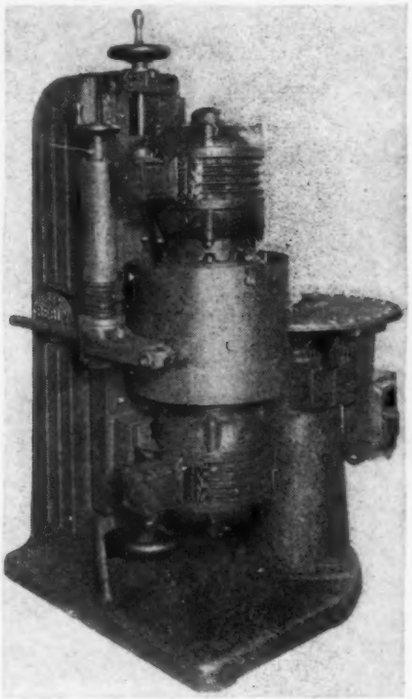
The table is 50 x 10 in., and saddle lengths are longer. An adjustable cutting head mounted on a movable ram permits the operator to perform horizontal, vertical or angular milling. The spindle can be furnished with No. 13 B&S taper or with No. 40 National Standard taper.

Front and rear directional control of all power feeds have provision for locking any feed in neutral. These directional controls are designed to provide ease of operation and visibility of the cutting operation from either position.

The No. 22M is available with either universal or plain saddle. Longitudinal range is 28 in., cross 10 in., and vertical 20 in. The machine has nine speeds from 40 to 1100 rpm., and 12 feeds from 0.5 to 36 ipm. The spindle motor is 3 hp., and the feed motor is 1½ hp.

The knee, saddle and table are designed as a unit for rigidity. The large knee has a large bearing surface to carry the knee on the column and provide maximum support for the saddle and table. The spindle transmission is built to include taper roller bearings.

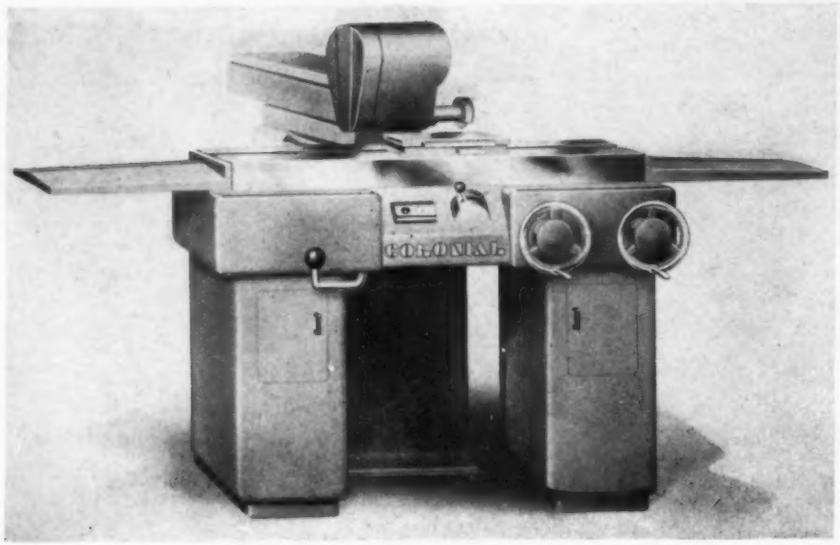
Besly Double Vertical Grinder Has Feed Wheel for Small Work



A double vertical-spindle grinder designed for high output on small parts has been introduced by Charles H. Besly & Co., 118-124 N. Clinton St., Chicago 6, Ill. The grinder has a horizontal rotary feed. The operator drops small parts into the feed wheel which is said to produce savings in time and reduce operator fatigue.

The Model 902 is designed for grinding steel rollers, carbon brushes, washers, ceramic parts and other small pieces. Low output costs are said to result primarily from higher feeding speeds. The machine will grind, for example, from 3,000 to 4,000 small coil springs per hour.

Colonial Broach Sharpening Machine Designed for Comfort of Operator



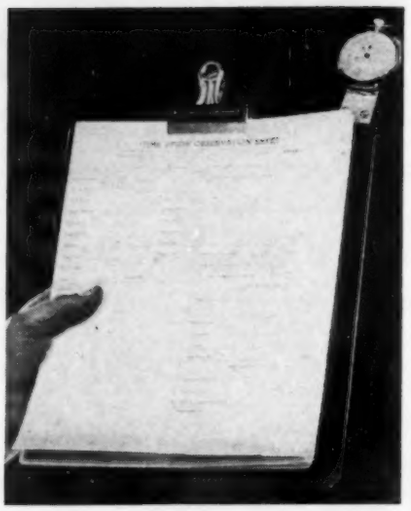
Adjustable cushioned stops guard against shock at the end of the travel of the cross-slide on this broach-sharpening machine

Operator comfort is emphasized in the design of a broach sharpening machine announced by Colonial Broach Co., Box 37, Harper Station, Detroit 13, Mich. It is possible for the operator to sharpen flat surface broaches several feet long while seated.

Two pedestals support the table at either side, forming a knee-hole at the back of which a third pedestal supports the grinder head. Handwheels to control lengthwise movement of the table and to raise and lower the grinder head are located at the right side of the knee-hole rather than in the center of the machine.

The main operating control on the machine, which moves the grinding wheel back and forth across the base of the broach teeth, is the "Lazy-reach" lever mounted on the front of the machine. It is adjustable to the most comfortable operating position for individual operators.

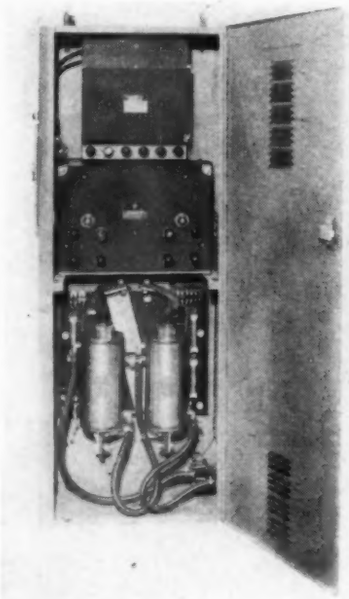
The table is 48 in. long with a 36-in. travel. The grinding wheel spindle can be operated at speeds from 4,000 to 10,000 rpm., through the use of interchangeable pulleys.



TIME-STUDY BOARD — Time-study board and stop-watch holder with a total weight of 8 oz. are produced by A. J. McDonald, 2248 N. Avers Ave., Chicago 47, Ill. The board is made of lucite to permit the operator to view reference data by reversing the board. Stop watches which are 2 in., plus or minus 1/16 in. in dia. can be held

GE Resistance-welding Controls Redesigned, Put in One Cabinet

The complete line of synchronous precision controls for resistance welding machines, produced by the Control Div., General Electric Co.,

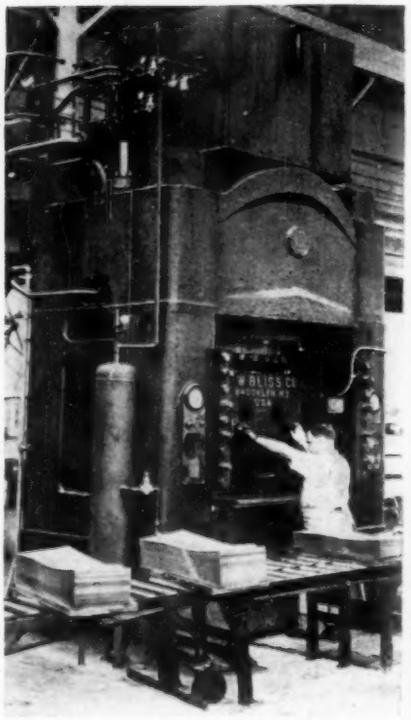


Schenectady, N. Y., has been redesigned. All components are compactly housed in one cabinet.

Components of the control system, meeting NEMA standards include ignitron contactors, a weld timer, electronic heat control, and—as optional equipment—sequence controls and tempering control.

The controls are designed for spot and projection welding on air-, fluid-, motor- and foot-operated resistance-welding machines. The cabinet is arranged for mounting on the right-hand side of the welding machine, on the floor or on a wall.

Bliss 1500-ton Hydraulic Press Has Universal Electric Control



The line of single-action hydraulic presses of the E. W. Bliss Co., 450 Amsterdam St., Detroit, Mich., has been extended by installation of a 1500-ton press at the General Electric Co. plant in Erie, Pa. The press

FOR "JOB SHOP" or "PRODUCTION" LATHE WORK

Operator just loads workpiece . . . starts cycle . . . then unloads finished workpiece!

Actually get more "Quantity Production" without sacrificing quality.

Far faster and easier on "job work" . . . no costly cams to change.

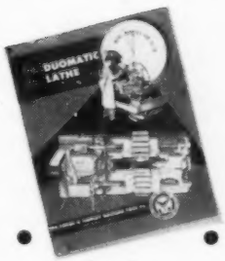
So completely automatic it's like a Lathe with a Man inside.

Any unskilled operator can handle the Duomatic . . . get greater output at less cost.

. . . do it with the New 2-A DUOMATIC

Even an unskilled operator can make production records with the Lodge & Shipley 2-A Duomatic (automatic) Lathe. This amazing new lathe, smaller model of the well-known 3-A Duomatic, is so fully automatic, it's just as though a skilled operator were actually working inside.

Just like the Lodge & Shipley 3-A, this Duomatic is two lathes in one. Front and rear tool slides operate singly or together . . . perform a wide range of straight or angular turning and facing operations. Whether on simple or complex multiple tool jobs . . . a production "run" or "job" work, the 2-A Duomatic gives you more profitable production. Let Lodge & Shipley Engineers prove how low your production costs *can be* with the new Lodge & Shipley 2-A Duomatic.



● *Send now for your copy of this new 32-page book on the 2-A Duomatic . . . packed with money-saving ideas, setting-up and cycle diagrams and illustrations. Ask for Bulletin 635.*

ENGINE
TOOL ROOM
MANUFACTURING
OIL COUNTRY
DUOMATIC (AUTOMATIC) LATHES

THE LODGE & SHIPLEY MACHINE TOOL CO.
CINCINNATI 25, OHIO, U. S. A.
MACHINE TOOL DIVISION 3055 COLERAIN AVE. • SPECIAL PRODUCTS DIVISION 800 EVANS ST.

L & S LATHES

is equipped with a 12-in. ram stroke and a hydraulic drawing cushion stroke of 6 in. It is shown drawing and piercing 0.025 in. thick stainless-steel evaporator plate for home refrigerators.

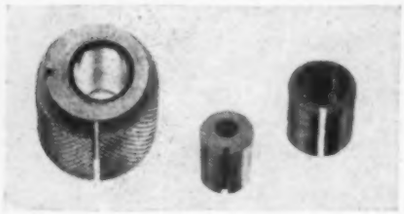
Features of the press include a rugged frame with shrunk tie-rods and keyed housing, positive drive of the closing stroke, universal electric control to provide speed change and reversal, safety control for instant stopping at any point, and delayed action of the cushion return.

Beach Air-conditioning Unit Cleans, Dries Compressed Air

An air-conditioning unit for compressed air systems, known as Sta-Dri, is produced by Beach Precision Parts Co., 120 Mechanic St., Boonton, N. J. The unit screens out scale, rust and dirt from compressed air pipe lines, and extracts moisture and oil fumes.

Model A-1 junior size handles approximately 30 cu. ft. of air per min., at 100 psi. Model A-2 senior size handles approximately 65 cu. ft. of air per min. at 100 psi.

Conex Products Drill Bushings Are Supplied Nearly Completed



A drill bushing which is furnished more than ¾ completed is produced by Conex Products, Box 629, Glendale, Calif. The blank consists of a sleeve and insert.

The sleeve is slotted to allow for slight expansion or contraction to fit the hole which will be the bushing location. The insert is made of tool steel with outside diameters, lengths and indexing slots completed. The eccentric drill-center is started with a drill and countersink tool. The insert is completed by drilling to the desired size and hardening with a blowtorch.

The sleeve has the same amount of eccentricity as the insert. Rotation of the sleeve with respect to the insert makes the drillsetter of the insert adjustable from dead center to 1/16 in. off center. Six sizes vary from maximums of 0.136 to 5 in.

Governor Opens Under Load On Rotor Tool Air Grinders

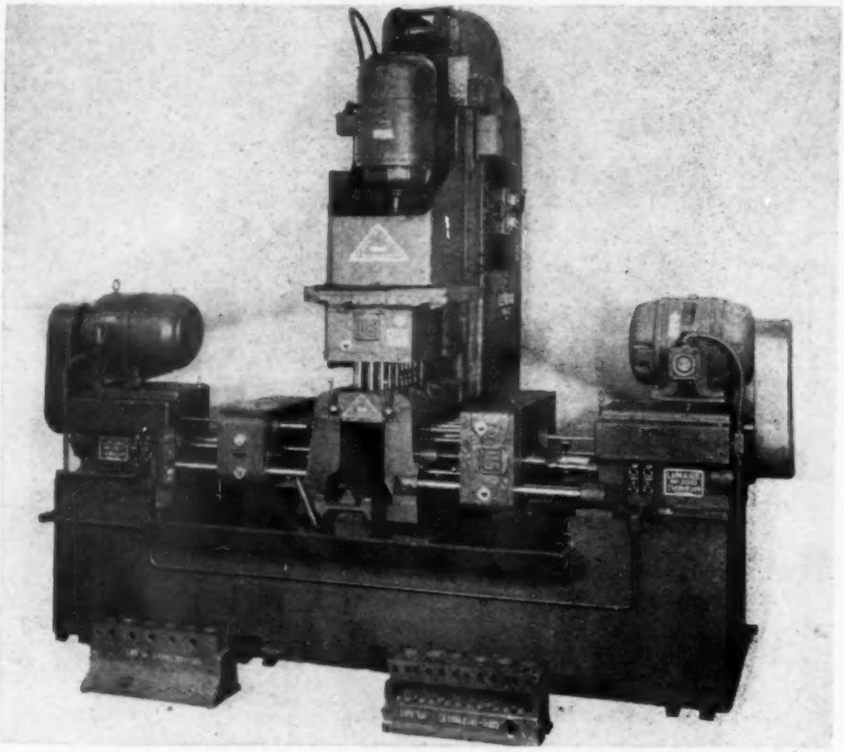
Two airgrinders, D-325 for 8-in. wheels, and D-125 for six-in. wheels, are announced by the Rotor Tool Co. 17325 Euclid Ave., Cleveland, Ohio. The machines weigh 11¼ and 9¾ lb. in the 8- and 6-in. models.

A new governor, M-801, idles the machine at permissible free speed and as soon as pressure is applied to the work, opens to deliver full air at high load speeds.

These grinders are said to have substantially increased power and higher load speed without addition to the weight of previous models. The principal parts are interchangeable.

Model D-325 is available with straight, spade or safety handle at speeds of 4500, 4100 and 3100 rpm. D-125 is available in speeds of 6000 and 4100 rpm.

LeMaire Three-way Drilling Machine Drills 63 Holes in Engine Blocks

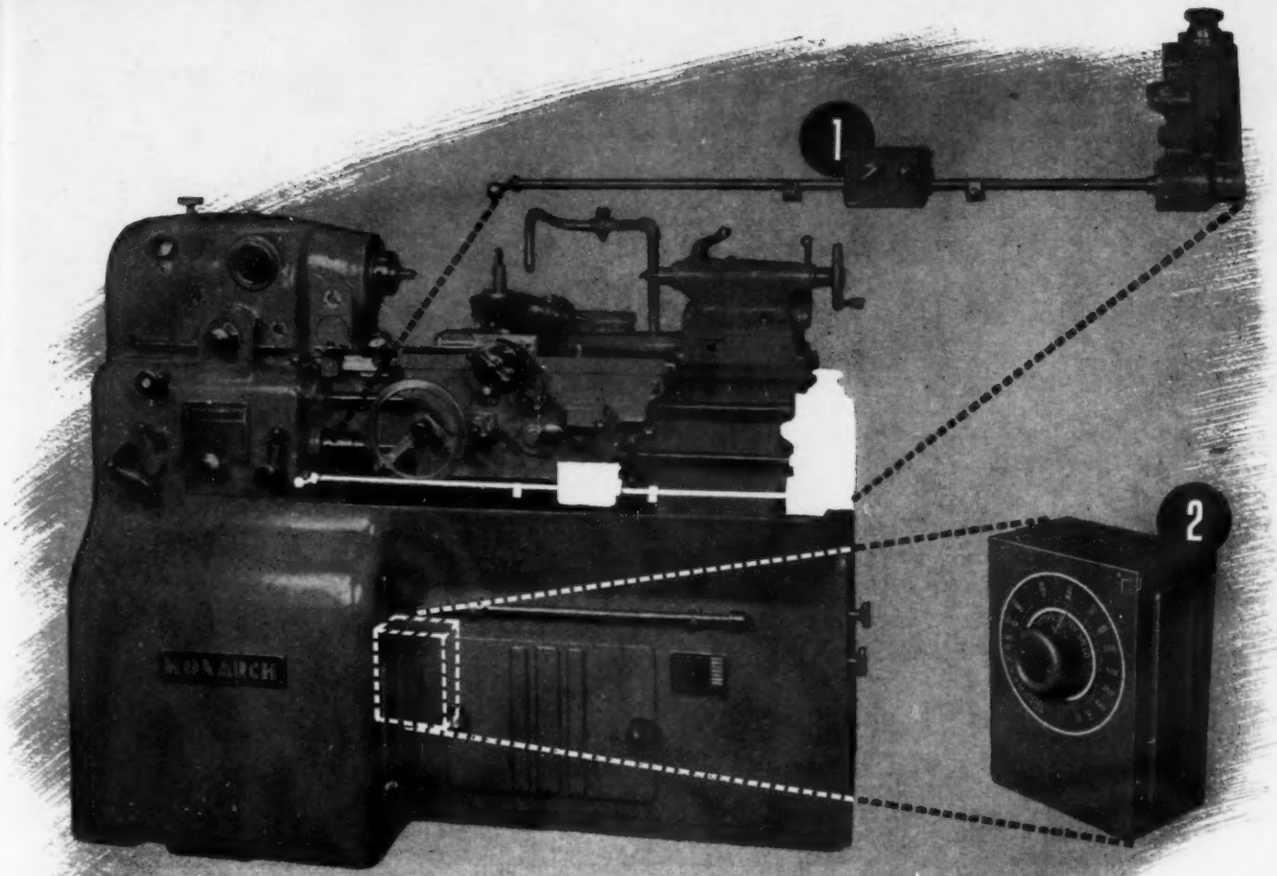


Standard units are used to make this three-way drilling machine for drilling holes in the top and sides of engine cylinder blocks

Holes are drilled in the top and both sides of cylinder blocks in a three-way drilling machine built by LeMaire Tool & Mfg. Co., 2657 South Telegraph Road, Dearborn, Mich. The machine drills 19 holes on the right side, and 34 holes in the top of the block. On the left side it drills and counterbores five holes, drills and spot-faces two holes, and drills three holes.

Two LeMaire No. 5,000 Twin-Ram units with multiple spindle heads are mounted at each end of a one-piece base. A No. 20 flange-type hydraulic drilling machine is mounted at the rear. A tunnel-type fixture incorporates all the drill bushings.

The part is slipped into the fixture on wear strips, guided by the crank bore to an approximate stop. Manually operated pins engage locating holes for final positioning. Production is approximately 60 pieces per hour, allowing 30 sec. to load and unload part.



TWO REASONS WHY you can chase threads UP TO 50% FASTER on a MONARCH

1—ELECTRIC LEAD SCREW REVERSE for chasing either external or internal threads. Users have found it particularly valuable for internal threading of blind holes. Its outstanding superiority is the direct result of two features exclusive in the Monarch design. First, work rotation automatically stops at the end of each cut. Second, the mere twist of a convenient knob adapts the mechanism to chase either right or left-hand threads—or makes it inoperative, for greater operator safety when gauging or loading and unloading the workpiece.

With the electric lead screw reverse you'll be able to chase more accurate threads—*and you'll be able to do it faster.* The flip of one lever reverses the entire machine, returning the cutting tool to its starting position for the next cut. You can maintain perfect timing between the tool and the work. Automatic stops are provided in both directions of travel.

2—VARIABLE REVERSE SPEED CONTROL mounted on the rear of the machine gives even greater speed in the operation of the electric lead screw reverse. With this control you can preset the reverse speed of the driving motor to *greatly accelerate* the return of the threading tool for the start of the next cut.

This is an exclusive Monarch feature—one that has enabled users to reduce floor-to-floor times by as much as 50 per cent on the longer threads.

These two exclusive Monarch attachments are typical of the many extras available on the Monarch 10" EE Sensitive Precision Toolmaker's Lathe—features designed to make the base machine exactly suited to your individual work requirements.

Regardless of the nature of your metal-turning needs, Monarch is ready with the latest designs, to give you *peak production at a profit.* May we talk it over?

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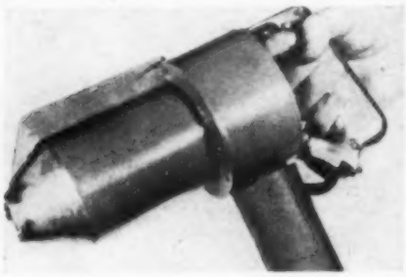
Monarch TURNING MACHINES

THE MONARCH MACHINE TOOL COMPANY · SIDNEY, OHIO

Tocco Heat Gun, Other Equipment Announced for Induction Heating

Four new developments in induction heating equipment have been announced by the Tocco Div. of the Ohio Crankshaft Co., Cleveland, Ohio. These include a portable inductor, a 30,000 cycle motor-generator type induction-heating unit, a variable ratio transformer, and a 7½ kw. induction heating unit.



The Heat Gun has been used with leads up to 20 ft. in length and longer leads can be employed if necessary

The Heat Gun is a portable inductor adaptable to cumbersome assemblies where many spot-heats are required or to short production runs. It is controlled by a trigger switch and utilizes a multiple turn coil to obtain the high flux density necessary in the area being heated. This permits the use of long leads of moderate dimensions to transmit power with high efficiency. It is used with the standard 10,000 cycle motor-generator type induction heating unit.

The 30,000 cycle Tocco machine triples the previous high-frequency limit of motor-generator type induction heating equipment. Previous equipment has been satisfactory for surface-hardening parts over ⅜ in. in diameter, but the new set is said to permit effective surface hardening of smaller parts.

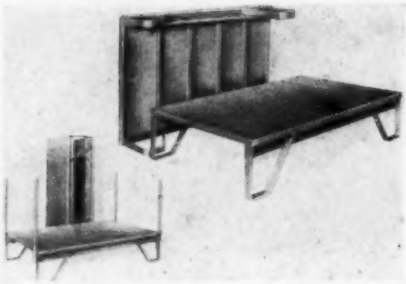
The variable ratio transformer is intended to increase the adaptability of motor-generator type induction heating equipment. The transformer can be made to match any size loads, any size inductor coil by a simple change of leads, so that one transformer is suitable for all jobs.

The 7½ kw. output Toccotron unit is an electronic-type induction heating unit which operates at about 3 megacycles. It is designed to increase efficiency on heating parts of a very small diameter or unusually thin strip stock.

30,000-cycle motor-generator type induction heating unit is designed for surface-hardening small parts

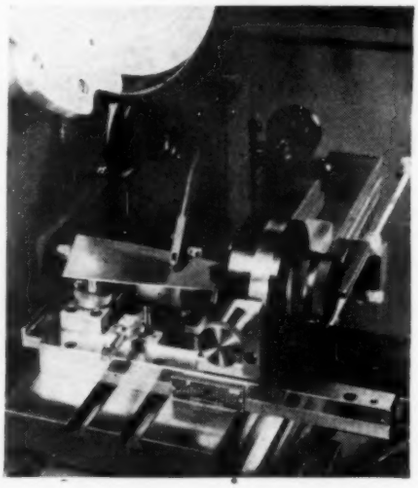
Cleveland Crane Steelweld Shear Adds New Electric Foot Control

A new electric foot control has been adopted as a standard feature on all Steelweld shears built by the Cleveland Crane & Engineering Co., Wickliffe, Ohio. The switch is connected to an outlet at the front of the machine by heavy cable and can be slipped to the most convenient spot for a particular job. It is a safety-tight switch which controls movement of the blade.



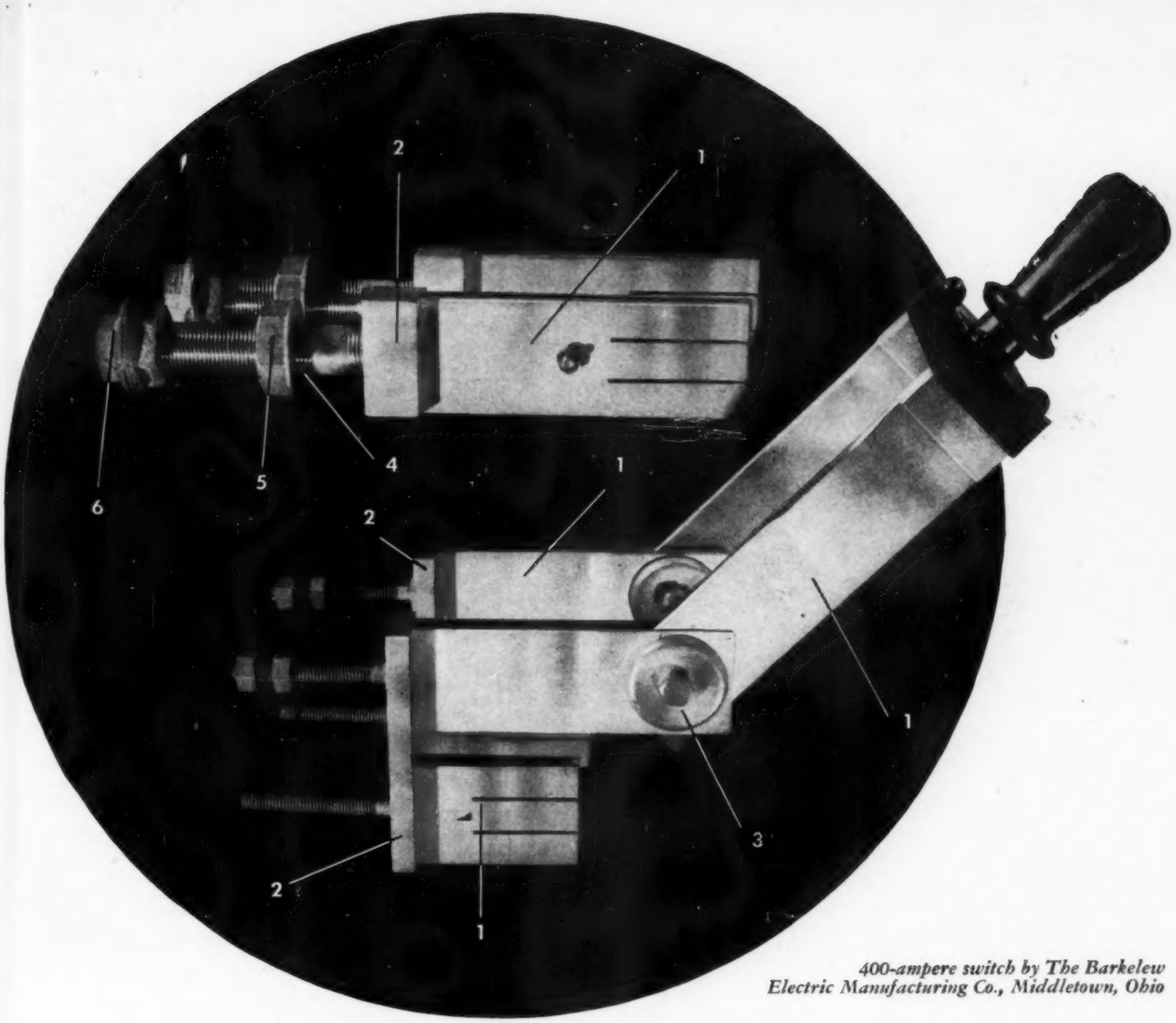
STEEL SKID PLATFORM—Steel deck panels of medium gage high-tensile steel form the surface of the platforms made by Market Forge Co., Everett, Mass. Platforms can be stacked on end when empty. Stake sockets can be included when required. Weight of the platforms is usually 15 to 20% lighter than conventional types

Blade Profiles for Jet Engines Are Inspected on Pant-O-Jector



A method for inspecting blade and bucket profiles on jet propulsion engines has been developed by Engineers Specialties Division, The Universal Engraving and Color Plate Co., Inc., 980 Ellicott St., Buffalo 8, N. Y. The "Pant-O-Jector" is used in conjunction with an optical comparator. A pant-o-graph arm traces the blade contour and a projector on the arm which has the same shape as the follower is projected on the comparator screen. The shadow traces the magnified contour on the comparator screen where it can be checked against a transparent chart-gage.

Chart-gages can be developed showing tolerance lines, so that the blade is acceptable provided the edge of the ball of light follows between minimum and maximum tolerance lines.



400-ampere switch by The Barkelew Electric Manufacturing Co., Middletown, Ohio

WIDE VARIETY OF REVERE METALS PERMITS EXACT SPECIFICATION TO MEET CONDITIONS OF USE

Note the number of different Revere Metals used by Barkelew in this switch, in order to assure low losses, reliability, accuracy, long life and economical manufacture.

1. *Electrolytic Copper.* For full conductivity.
2. *Free-Cutting Copper.* For quick, economical, trouble-free machining; in this case, producing sharp, clean, accurate slots and tapped holes in the copper base blocks. Free-cutting copper is rated in excess of 70% machinability of free-cutting brass, depending on type of operation.
3. *Herculoy.* Has the strength of mild steel, the corrosion-resistance of copper. The Herculoy washers in this switch assure permanence of pressure.
4. *Brass.* Washers, stamped out of sheet.
5. *Free-Cutting Brass.* Nuts, machined from free-cutting rod.
6. *Cast Electrolytic Copper.* For nuts not presenting machining problems.

Materials were very carefully chosen in designing this switch. For example, the hinge block for the high clip must have two slots milled in it to receive the clip leaves; Revere Free-Cutting Copper was selected for its superior machining characteristics. Slots in the lower hinge blocks are sawed all the way through, and here Revere Hard Drawn Electrolytic Copper is suitable.

Revere will gladly cooperate with you in working out the most advantageous application of metals to your products. Revere Metals are: Copper and Copper Alloys, Aluminum and Magnesium Alloys, Electric Welded Steel Tube.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; New Bedford, Mass.; Rome, N. Y. — Sales Offices in Principal Cities, Distributors Everywhere.

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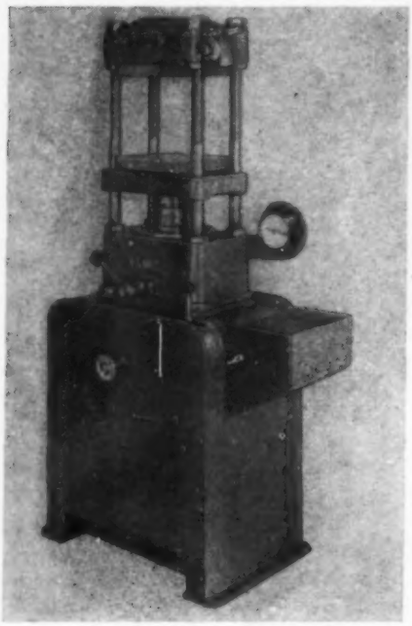
Elmes Builds Hydraulic Press Powered with Compressed Air



A line of hydraulic presses in which compressed air from the shop line provides the power has been developed by the Elmes Engineering Works of American Steel Foundries, 1002 Fulton St., Chicago 7, Ill. The compressed air introduced above the liquid provides the power for rapid closure and full pressure. It will apply and maintain any desired pressure within the capacity of the press and repeats until reset.

Designed for molding plastic and rubber, forcing, straightening, and testing, the presses are made in 20- and 30-ton bench and floor models, and in a 50-ton floor model.

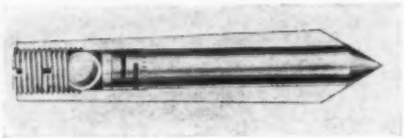
Upton Furnace Salt Bath Process Prevents Electrode Deterioration

A process to prevent the wasting away of electrodes in high-temperature salt-bath furnaces has been developed by Upton Electric Furnace Div., 7450 Melville at Green, Detroit, Mich. Electrodes in Upton furnaces are sealed into the bottom of the furnace to reduce deterioration, but it is not entirely prevented.

On each side of the pot above each electrode there is an overhang of refractory material. A graphite rod is placed under this overhang, and being of considerably lower specific gravity than the salt, is held against it once placed in position. Oxides which form in the molten salt (the formation of which is responsible for wasting of the electrodes) contacts the graphite rod and are reduced to a metallic state. They form a scale on the rod. Contact with the rod increases the carbon content of the scale and reduces its melting point until it melts and drops on the electrode. Since the scale is now removed from the rod, the oxides in the bath reduce its carbon content until it becomes an integral part of the electrode. When the carbon rod has been consumed, a new rod can be inserted under the overhang.

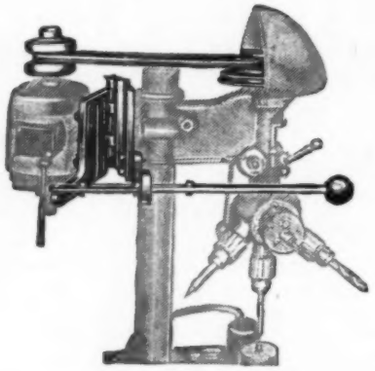
If necessary, the process can be speeded by dropping cast iron into the bath.

Vanderwall Live Lathe Center Is Same Size as Dead Center



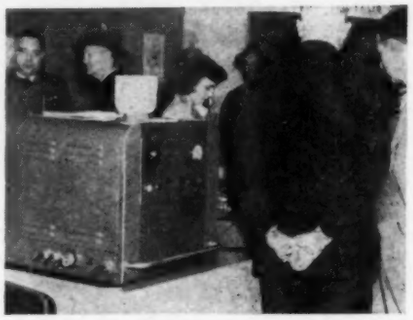
A revolving-tip lathe center with the same dimensions as standard solid centers is announced by E. H. Vanderwall Co., 440 Golden Gate Ave., San Francisco, Calif. The Evco live center has a hardened steel center spindle with long bearing surface. Thrust is taken by a replaceable steel ball and thrust plate. The centers are available in No. 2, No. 3, and No. 4 Morse taper shank.

Chicago Drillet Speed Changer Uses One Variable-Speed Pulley



A speed changer for drill presses which uses one variable-speed pulley and one four-step cone pulley is announced by Chicago Drillet Corp., 1729 N. Winchester Ave., Chicago 22, Ill. A standard drill press equipped with the speed changer will have a speed range of from 435 to 4550 rpm. A single lever is used to change speeds.

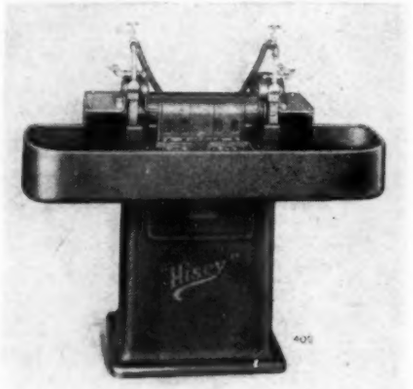
RCA 1-kw. Electronic Generator Used for Brazing and Soldering



Brazing and soldering small and medium sized work is the purpose of a 1-kw. electronic power generator developed by RCA Engineering Products Dept., Camden, N. J. The 1-AL generator is a vacuum-tube unit which converts the 60-cycle power supply to a frequency of approximately 400,000 cycles per sec. The generator unit also contains an automatic timing device for presetting the interval of operation.

The applicator unit can be used up to 25 ft. from the generator. It houses an output current transformer and associated components. This permits operation at a distance from the generator.

Hisey-Wolf's Wet Grinders Have Improved Bearing Seals



The line of wet grinders produced by the Hisey-Wolf Machine Co., Cincinnati 25, Ohio, has been redesigned. The grinders are made in sizes for 10, 12, 14, 18, 20, 24, and 30 in. grinding wheels. Machines are made single or double end, and in a model with one wheel for dry operation and the other for wet grinding.

Improvements include improved bearing seals, motor mounting, and settling chamber. The pump is of the self-priming type with individual control valve for each wheel.

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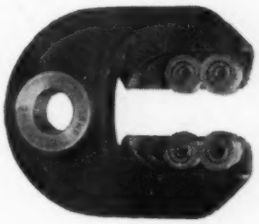
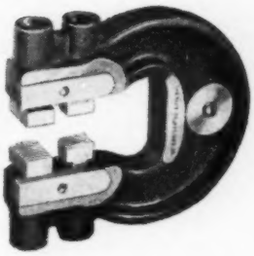
Style 9424—Thread Ring Gage

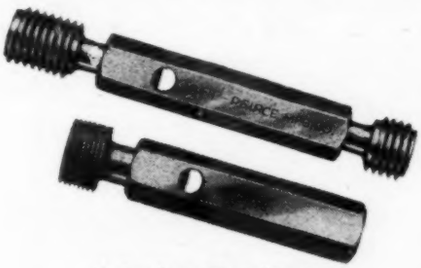
Style 9416—Thread Plug Gage



Style 9435—Roll Thread Snap Gage

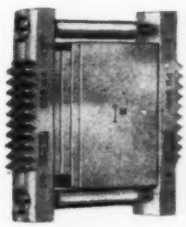


Style 9432—Thread Snap Gage



Style 9420—Thread Setting Plug Gage
Style 9474—Pipe Plug Gage

Style 9475—Pipe Ring Gage



Style 9431—Thread Setting Blocks

The exceptionally complete line of Taft-Peirce Thread Gages includes: Single and double-end limit plug gages (steel or cemented carbide) together with thread-setting plugs and thread-setting blocks. Pipe thread gages, ring thread gages, adjustable snap gages, and roll thread snap gages. Also many special types of thread-gages, and thread measuring wires.

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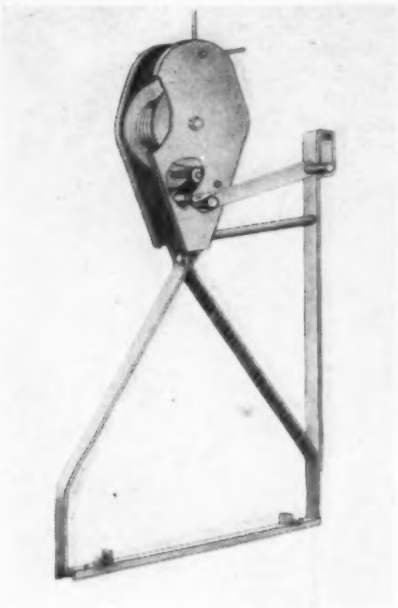
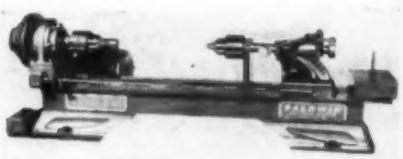
Safway Products Swing Stage Gear Operated, Has Double Safety



Safway Steel Products, Inc., Milwaukee, Wis., announce the Saf-T-Swing, a light-duty swing stage designed for maintenance work and other jobs high above the ground. The swing consists of two winches, one of which is illustrated, each equipped with 150 ft. of cable. A stirrup which will take a platform up to 28 in. in width is bolted to each winch.

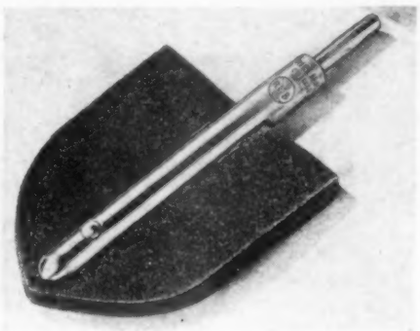
The winch is entirely gear-operated. A positive lock mechanical brake in the crankshaft assembly is engaged automatically when the operator removes his hand from the crank handle. Another safety feature is a lever, located at the top of the winch, which must be released in order for the operator to crank the winch down. If the operator removes his hand from the lever, lowering automatically stops.

Sonntag Torsion Testing Machine Checks Wire from 0.090 to ¾ in.



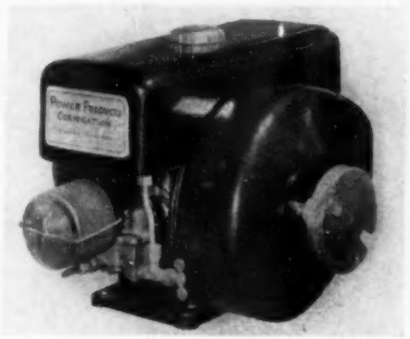
A torsion testing machine for wire developed by the Sonntag Scientific Corporation is distributed by Baldwin Locomotive Works, Philadelphia 22, Pa. The machine will test bronze and copper trolley wire, telephone and telegraph wire, and steel tie wire with diameters from 0.090 to ¾ in. in diameter.

Twisting speeds of 10, 20 and 30 rpm. with reversible rotation are available. Maximum torque is 1000 in.-lb. and stresses up to 80,000 psi. can be obtained on ½ in. specimen.



POLISHING—RB Abrading Pads for cleaning and polishing are distributed by Wilkinson Equipment Co., 109 E. 69th St., Chicago 37, Ill. They are made of from 2 to 14 plies of abrasive elements die cut in four standard shapes. They come in sizes from 1/2 by 2 in. up to 9 x 10 in., and are available from 24 to 320 grit

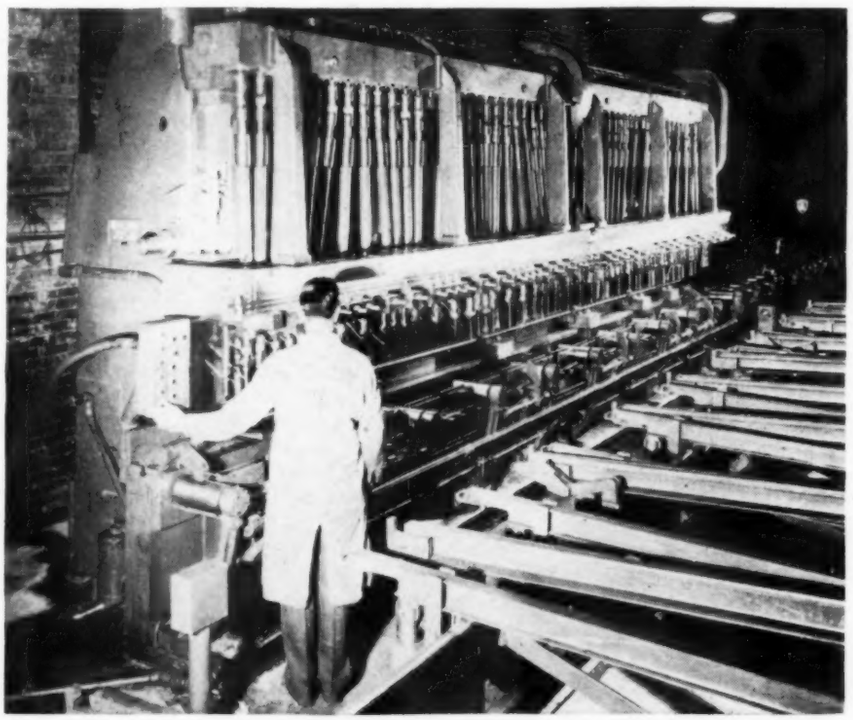
Power Products Gas Engine Made of Aluminum; Is 1 hp.



An aluminum gasoline engine of ¾ to 1 hp., for portable and self-propelled equipment is announced by Power Products Corp., Grafton, Wis. The engine weighs approximately 16 lb.

The engine is single-cylinder, two-cycle, air-cooled, with dimensions 18½ x 11 x 14 in. It will operate for three hours on a tank of gas, 0.4 gal.

The engine will operate when it is tilted up to 45° from the horizontal.



DRILLING MACHINE—This adaptation of the HU68 design drills sections of railroad rails as long as 39 ft. Made by Moline Tool Co., Moline Ill., the machine includes a loading mechanism on which parts to be drilled are grouped together and from which they are loaded into the fixture on the machine in position for drilling. Two sections of the machine, which are indivIdually driven, have a total of 40 spindles, 38 rated for 1⅝-in. drills and two for 1½-in. drills. Power driven rolls in the fixture bring the end of the rail assembly against a positive stop for location prior to drilling

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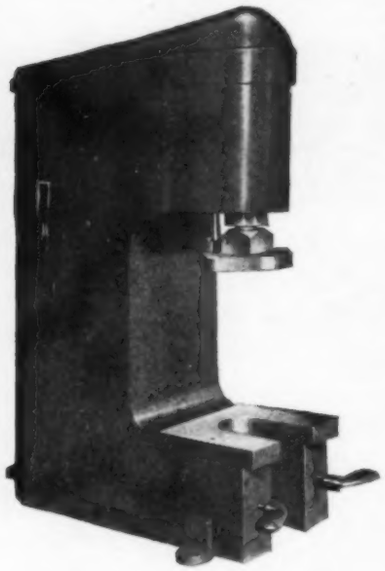
ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

Bryant Products 5-ton Press Has Air-hydraulic Operation

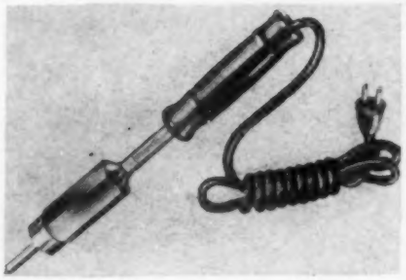


A 5-ton air hydraulic press, equipped with four-way balanced valves, is announced by Bryant Products Co., Jackson, Mich.

Designed for use on a bench, the press has all working parts contained in the housing. A synthetic rubber "O" ring is used in the press. Inside surfaces of the air cylinder which can contain moisture are hard chrome plated.

Johnson Model 616 Gas Furnace Melts 600 Lb. Lead in 29 Min.

A melting furnace which will melt 600 lb. of lead in 29 min., Model 616, is announced by Johnson Gas Appliance Co., 589 E. Ave., N.W., Cedar Rapids, Iowa. It is equipped with six atmospheric fired Direct Jet bunsen burners, each with independent shut-off valve and pilot light. Temperatures up to 1500 F. are reached with six burners and held with three burners.



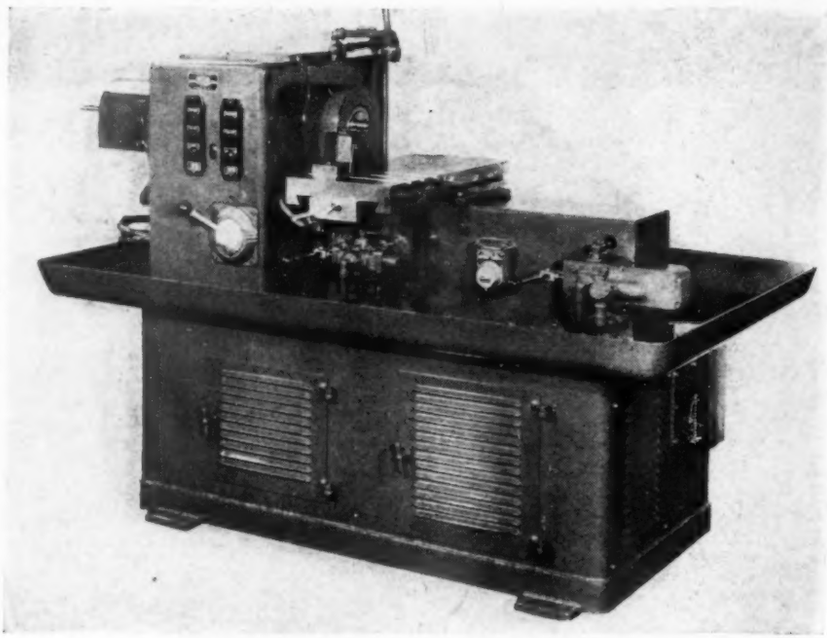
SOLDERING IRON—A 300-watt soldering iron with a 3/8 in. (instead of 7/8 in.) dia. tip is announced by Hexacon Electric Co., 135 W. Clay Ave., Roselle Park, N. J. This construction provides extremely high heat for a small-tipped cross section and is fitted for fast production line soldering

Instrumaster Drafting Triangles Are Held off Paper by Buttons

A line of drafting instruments known as Instrumaster is announced by Instrumaster Industries, Inc., Arch St., Greenwich, Conn. Five stencils for Axonometric drawing include one containing 27 ellipse openings, representing circles from 1/8 to 2 in. dia. An isometric protractor permits plotting and measuring angles directly in any of the isometric planes.

Floating triangles are provided with integral buttons projecting on both sides so the triangle is kept 0.020 in. from the surface. Hatching stencils permit precisely spaced cross-hatching at 30, 45 or 60°.

Oster No. 650 Semi-Automatic Lathe Has Hydraulic Cross-slide Operation



Automatic chuck capacity of the Oster No. 650 lathe is 1½ in. The hydraulic control pump and centrifugal coolant pump are driven by individual motors

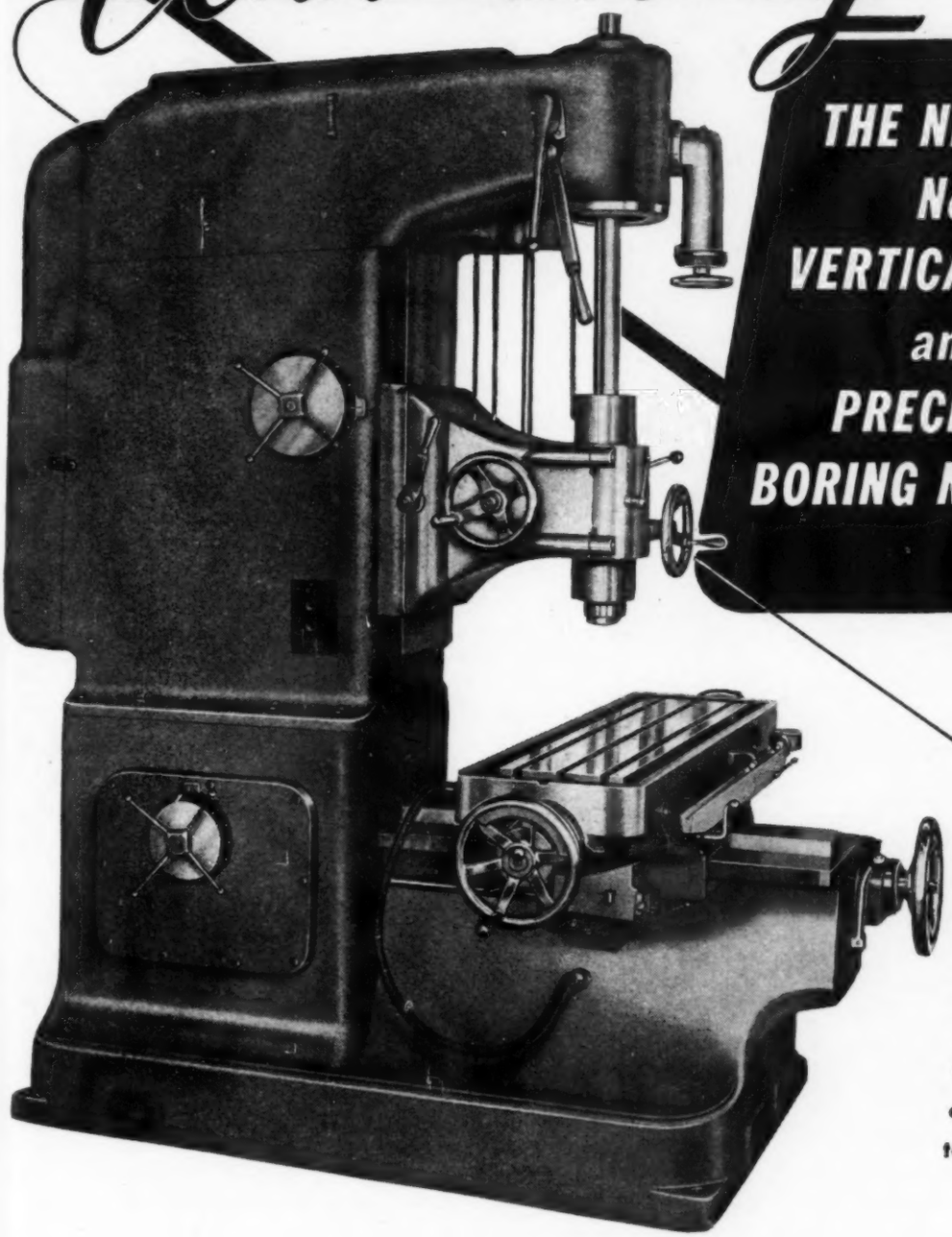
A semi-automatic lathe, No. 650, is announced by the Oster Mfg. Co., Cleveland 3, Ohio. The lathe is equipped with a 4-speed motor and hydraulic feeds. Either single- or double-action cross-slide can be furnished.

The hydraulically operated cross-slide provides an automatic cycle of fast approach, feed, dwell, fast retraction, and stop. The 7½-hp., 4-speed motor supplies direct drive. Motor speed is controlled by a selector switch. Starting and stopping is controlled by push button.

The cross-slide is actuated by a 3½-in. dia. hydraulic cylinder controlled through a lever and solenoid-operated valve. Solenoid can be disconnected for hand-operation during set-up.

The automatic chuck is equipped with a draw-back collet with an adjustable work stop in the spindle. The collet is controlled by a lever-operated valve mounted on the bed.

Announcing



THE NEW KNIGHT No. 50 VERTICAL MILLING and PRECISION BORING MACHINE

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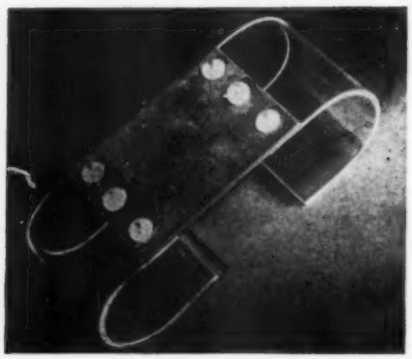
Parts and Materials

Douglas Aircraft Makes Rivets Of Plexiglas for Light Metals



Rivets made of Plexiglas which can be used to fasten light metals, plastics, and other materials, have been developed by Douglas Aircraft Co., Santa Monica, Calif. The rivet can be clinched without shock by heating and expanding the rivet with air pressure.

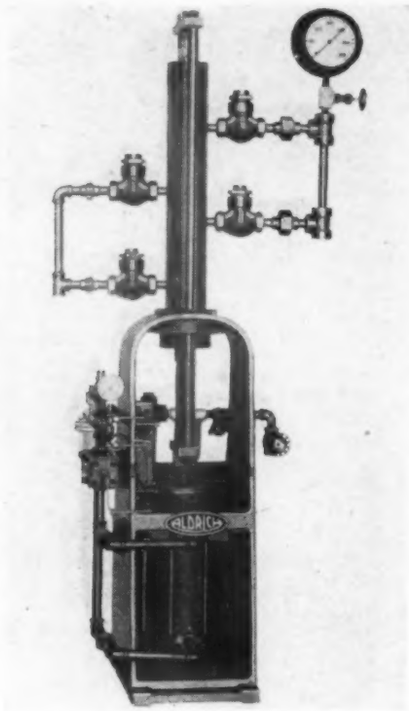
Both solid-head and hollow-shank rivets can be made. The heat-expansion method of insertion permits use as blind fasteners. They are available in colors for decorative effect.

Two models of combined air and heater guns are available to apply the rivets. One is completely automatic with a magazine loading device, the second is manually operated and requires individual insertion of the rivets.

Aldrich-Lytle Hydraulic Pump Is Powered by Air Pressure

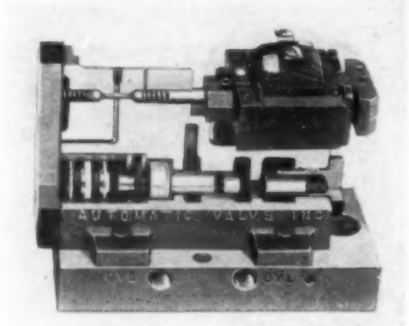
A hydraulic pump which is powered by air, the Aldrich-Lytle Hydropneumatic power unit, is announced by Aldrich Pump Co., Allentown, Pa. The pump is designed to provide low-volume, high-pressure service for hydraulic presses in small molding press plants and for other applications.

Both initial and operating costs are claimed to be lower than for electric or motor-driven units. The pump stalls when the desired hydraulic pressure developed corresponds to the air pressure used. Pump delivery is not displaced



through a relief valve—the relief valve is located in the air supply line. The pump will hold a desired hydraulic pressure without motion. It will "creep" to compensate for leakage.

Automatic Valves' 4-port Unit Can Be Mounted Near Cylinder

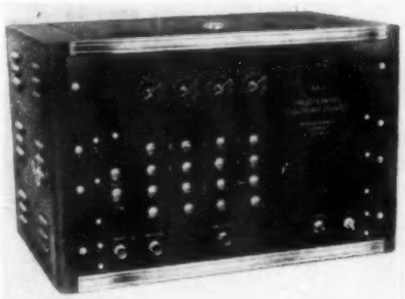


A four-way, four-port air valve designed for controlling air cylinders actuating machine-tool operations is produced by Automatic Valves, Inc., 37415 Grand River Ave., Farmington, Mich. The Model SV-4 solenoid-operated valve is small enough to be mounted close to the cylinder. It is made in ¼, ⅜, ½ and ¾ in. sizes. The valve is also made in a 5-port type for differential air pressures from 0 to 150 lb.

Vanadium-Alloys Die Steel Is Machined After Hardening

Speed-Cut, a die steel with a composition suitable for plastic molds and die-casting dies, is produced by Vanadium-Alloys Steel Co., Latrobe, Pa. The free-machining quality of the steel permits hardening prior to machining.

It is said to machine as readily at 300 Brinell as other steels used for this purpose in their annealed state. Air hardening to produce a hardness of 300 Brinell or higher in large sections is possible. Speed-Cut is a homogeneous steel that does not depend on high sulphur or non-metallics for its free-machining qualities, so that high surface finishes are obtainable from polishing. It is said that shallow and medium depth impressions can be hubbed when the steel is in the annealed state.



ELECTRONIC COUNTER—Model 140 single channel predetermined counter will count and control at rates of 15,000 per min. and higher if required. Built by Potter Instrument Co., 136-56 Roosevelt Ave., Flushing, N. Y., the unit actuates a control which will automatically stop or divert the flow of materials when the predetermined number has been counted. Input to the counter can be derived from a photoelectric beam, contact closures, shaft rotation, reciprocating members, electro-magnetic field disturbance and other action

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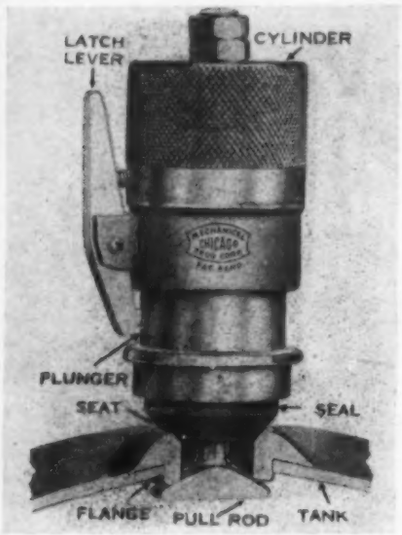
SPRINGFIELD, VERMONT, U. S. A.

Mechanical Products Test Plugs Seal Tank Openings for Testing



Self-sealing test plugs for closing openings in tanks, which are to be tested by internal pressure, are produced by Mechanical Products Corp., 168 N. Ogden Ave., Chicago 7, Ill. The "Hydro-Matic" test plug can be inserted or removed in a few seconds. An oversized tapered head on the pull rod centers itself against the inside edge of the tank opening and sets up a resistance to the pull exerted within the cylinder when forcing the seal against its seat.

Plugs are available from stock for ½ to 2 in. standard pipe thread openings, suitable for testing pressures up to 500 psi. To install the plug, it is inserted in the tank opening and the lever released to seal the opening. To remove the plug, the cylinder is pressed down until the lever engages the latch on the piston and the plug is removed.

Houghton's Cleaning Compounds Include 17 Different Products

A series of 17 different products including cleaners for maintenance work, ferrous and non-ferrous metals, for use prior to painting or vitreous enameling, electrolytic cleaners and special purpose compounds, is announced by E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa. Known as the Houghto-Clean 200 Series, the series of cleaning compounds is the result of a two-year study.

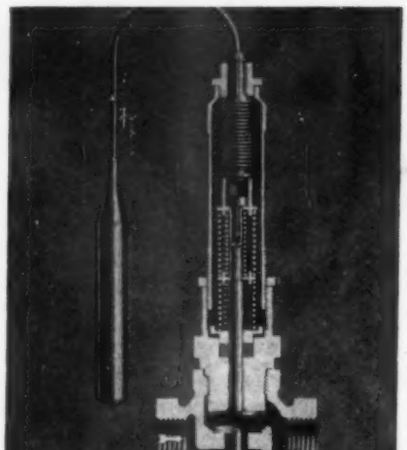
Each is said to be a new formulation and not a revision of former products. Advantage has been taken of recent developments in detergency and wetting out wherever possible. New alkalies have also become available as the result of wartime research.

Blackmer Flat-belt Pumps Have Improved Belt Shifter

Improvements in the flat-belt drive rotary pumps produced by Blackmer Pump Co., Grand Rapids, Mich., include a combination bracket and belt shifter of 1-piece construction. It supports the pulley end of the pump shaft in a bronze-bushed bearing. Rigidity of the new bracket is said to prolong bearing life and maintain better shaft alignment.

The new shifter, which is curved to match the contour of the pulleys, is said to provide faster and easier belt control. The structural steel face with transverse trusses has been adopted which is said to be lighter in weight and stronger than the previous cast-iron base. Pump capacities range from 10 to 750 gpm. with pressures to 100 psi.

Leslie's Temperature Regulator Controls Gas Supply to Process

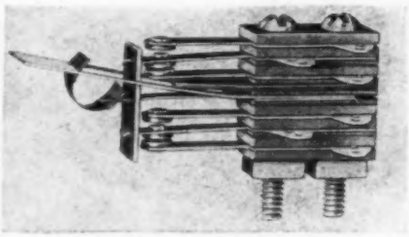


A self-contained, direct-operated temperature regulator for gas control to process heating, Class MG-2, is announced by Leslie Co., 129 Delafield Ave., Lyndhurst, N. J. The regulators operate over ranges from 20 to 600 F., at inlet pressures up to 25 psi. They are supplied with screwed ends ⅜, ½ and ¾ in. sizes.

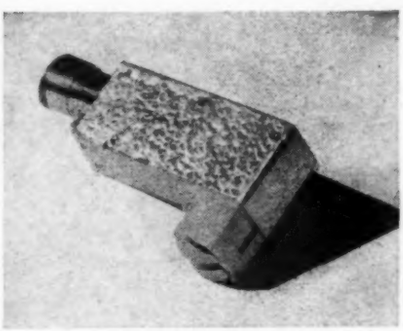
Various bulb and bulb casing materials are available. The liquid-expansion type thermostatic element has a piston-guided bellows. The regulators only pass the gas required to reach the preset temperature.

Gruv-Seal Forged Gaskets Seal High-pressure Pipeline

Forged gaskets for valves, valve bonnets and flanged connections for high-pressure and temperature pipeline are produced by the Steel Improvement and Forge Co., Cleveland 14, Ohio. For use where connections must be easily disassembled, the Gruv-Seal rings are forged of different metals to meet specific requirements. It is possible to make a connection by wrench pressure as tight as a weld.



OPEN-BLADE SWITCH—Compact two-pull snap switch has patented beryllium rolling spring. Produced by Acro Electric Co., 1321 Superior Ave., Cleveland 14, Ohio, it is made with single and double throw contacts. Standard operating pressures are 3 to 5 oz. The switch is rated at 15 amp., 125 volts ac.



PROFILOMETER TRACER—Type MA tracer developed for Profilometers by Physicists Research Co., 321 S. Main St., Ann Arbor, Mich., is self adjusting. Smaller than the tracer it replaces, it will go through a 7½ in. inside diameter hole. No adapters are needed to use the tracer on existing Profilometer units

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Provides uniform shoulder for curved abutting surfaces, for bearings with large corner radii.

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Takes up end-play rigidly or resiliently, accommodates accumulated tolerances.

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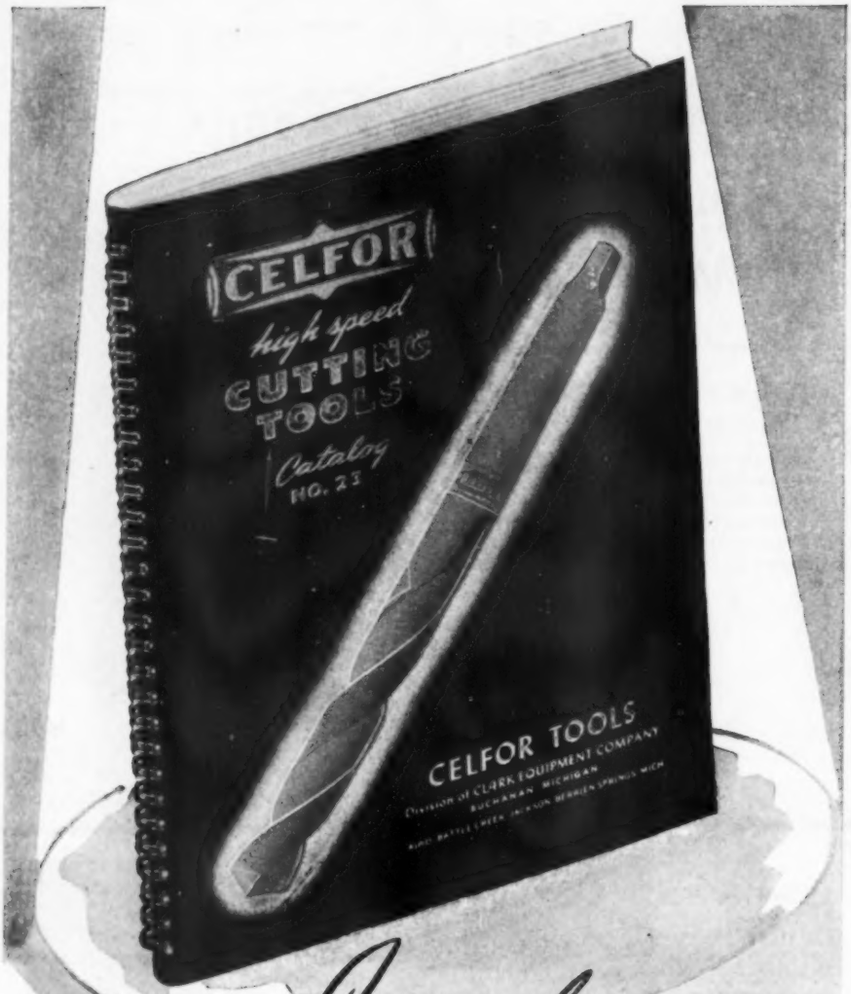

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ROUND TABLE *Discussion*

CAN WORK BE A PICNIC?

"Al's" idea of affording families an opportunity to know what shops are like has more merit than meets the eye. Whether results are gratifying will depend on the mechanical sense and interest of the families concerned. An important point overlooked by both Al and Ed is that families don't, in the main, consist of females and a father only, and that it is probable that the boys of the family will be eager to see the inside of the building where their father works and to know what goes on there.

When a very small boy I used to look at the tall chimney stack towering above the roof of the factory where my father worked. It was a perpetual source of wonder to me that the factory roof should be strong enough to support such a tall chimney. I voiced my perplexity to my father, who, being a "big shot" at the works, took me down one day for a "see how." I learned from that visit that the chimney continued right down through the roof and rested on a more secure foundation. That visit was a forerunner of many. The highly polished steam engine in the power house became a matter for wonder and delight.

The railway station agent in the town in which we lived was a friend of the family. As I grew older I spent much of my time at the station. He allowed me to close carriage doors when the train was in motion, collect passengers' fares, etc., thus inspiring me with the desire to become a station agent. Before I completed my studies, I pleaded with my parents to be allowed to accept a clerkship on the railway. They agreed and I stepped out into a new world. The venture was not a complete success. I was much more interested in engines and trains than in invoices and ledgers. A year later found me back at college completing my course and turning more and more to things mechanical. Originally my parents had hoped I would "go into" the Church, but, ironically, my father had encouraged me toward a mechanical slant by allowing me the run of the works in my formative years.

The moral would seem to be obvious. If industry wants enthusiastic recruits, catch them young and show

VICKERS HYDRAULIC CONTROLS

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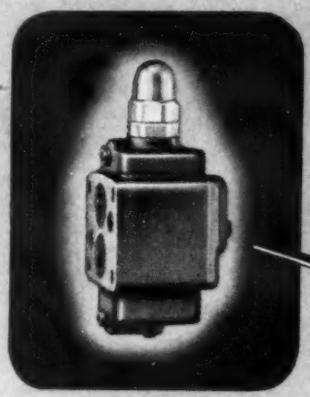
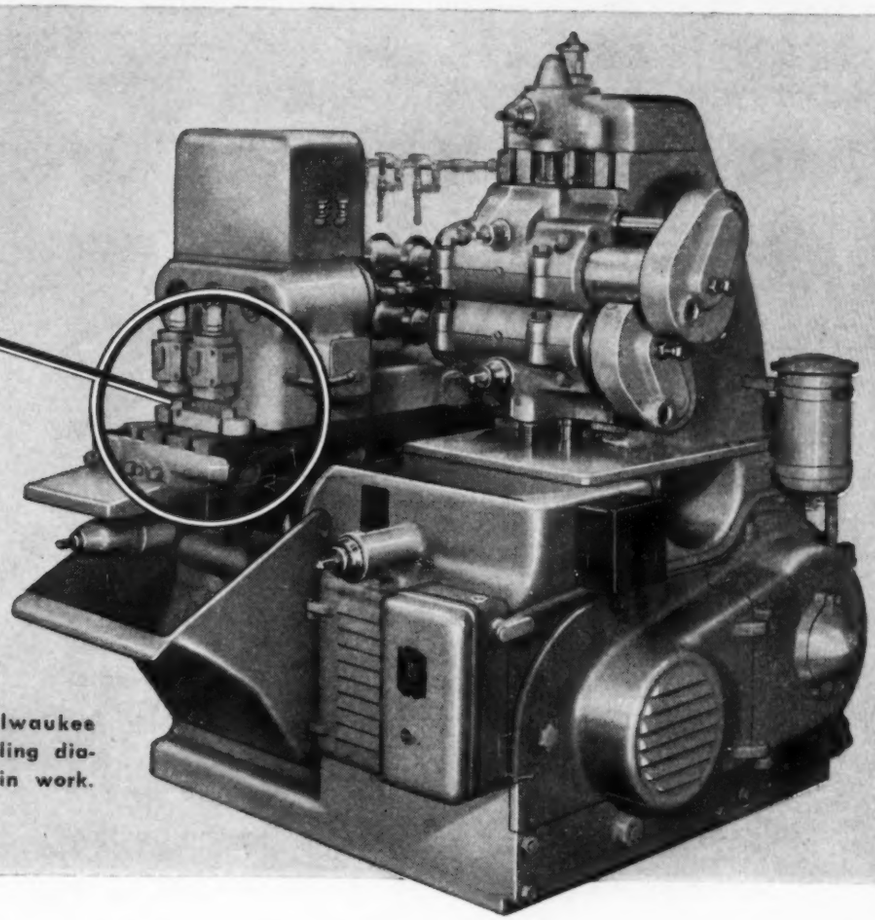


Vickers Hydraulic Sequence and Check Valve.



Kearney & Trecker Milwaukee Simplex for multiple milling diametrically opposite slots in work.

This is the second in a series of applications each pointing out one or more of the many advantages of Vickers Hydraulic Controls.

There is a representative installation of Vickers Hydraulic Controls featuring interlocking of machine operating phases by a combination of pilot interlocks and pressure sequence control valving. Three work arbors are indexed to position for simultaneous slot milling . . . accurate register and timing being assured by series connected pilot and pressure sequence interlocks. Thus all three pieces are in proper position before cutters approach the work. The same positive interlocking prevents succeeding automatic index until cutters are clear.

Other advantages of these valves: (1) they automatically provide "cushioned" operation, and (2) their ease of adjustment saves set up time when a variety of types of work is to be accommodated.

Our application engineers will be glad to discuss adaptations of Vickers Hydraulic Controls to your products.

New BULLETIN

Bulletin 45-34 on Vickers Pressure Control Valves includes operation, typical applications and installation of unloading, sequence, overload relief and counterbalance valves.

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them around! A goodly number will inevitably gravitate towards it in due season.

In a lesser degree, the theory applies to girls. On a works visit they are sure to see trim, purposeful feminine figures, dashing around, operating office machines, and supervising employees' welfare. In this way the workshop can become a permanent exhibition and recruiting center, acting as a much needed feed for expanding industry.

W. D. Mackinnon
Lanarkshire, Scotland

•

DO MACHINES MAKE JOBS OR TAKE THEM

There can be no doubt that if in bygone ages an Eastern people had not devised the wooden plough, the tillage of soil would still be a matter of digging. If sailing, and later steamships, had not been developed, all sea travel would be confined to the use of vessels propelled by oars. If Trevithick had not improved and had not invented the locomotive, and if Stephenson had not used it in conjunction with his improved "iron road," all journeys on land would still need horses. In all of these developments, fewer men have been necessary to perform the same job. Similarly, the invention of the power printing press, the spinning frame, the power loom, the typewriter, the automatic machine has brought about the same results. But the "Ed" type condemns them all.

Much of the blame can be traced to the water boiling in that silly little Scottish kettle which could not hold its steam. Presumably, James Watt could be arraigned as the arch criminal; it was his "blethering" which made all this labor saving possible by the use of steam power. Oh, the labor that could have been used; the slave labor required for the building of the pyramids would have been but a flea bite!

But surely this is taking the short and narrow view; to be so near the houses that all that can be seen is bricks. The better use of manpower ought always to be the aim. What does history say? Have these inventions or improvements reduced or, ultimately, increased the demand for men?

Invention of the linotype put many compositors out of work, but its use increased capacity, reduced costs of production and, in so doing, was instrumental in increasing the supply and demand for printed matter. More, not less, labor was eventually needed.

This is the usual result: more

papers, more books, more bicycles, and more motor cars of improved quality and at prices which would have been impossible if the striving after efficiency of the "Als" had been successfully contested by the "Eds." It would be good if Ed would figure out the cost of a bicycle made by the methods he seems to advocate. Would its cost be prohibitive? Ed may refuse even to consider the use of such a time- and labor-saving method of transport!

Is there really a question? The aim should be the best use of labor; to increase production per unit of time, and by so doing, to reduce costs. This would be good for the world in that it would have more commodities of every sort. Without these improved machines and methods, could men be fully fed and properly clothed today? It is said "where there is no vision, the people perish." More improvements in machines will further increase demand and thus call for even more labor.

J. E. Powell
Lincoln, England

•

SHOULD A MAN OWN HIS OWN TOOLS?

That depends on the man. If this had read, "Should a Machinist Own His Own Tools?" there would be no discussion, for he should, and to be worthy of his calling, he does.

The war has swollen the ranks of "hammer mechanics" to a point where in many shops they represent a large majority. Since the labor shortage, particularly of skilled men, is still with us, these men still retain a place in industry and still obtain salary increases with relative ease. Shortages of supply, demands for production, and runaway unionization have destroyed for a time trade unions of the guild type and any incentive for apprenticeship with its acquired knowledge. The most serious loss is the respect a man won for himself because he knew he had "served his time" and could be trusted to "feel" his mikes or grind a high-speed tool bit without someone mounting guard over the water can.

Before the war, apprentices were making 26 cents an hour the first year and 32 cents the second. They were required to purchase during their first year at least a 6-in. scale, a pair of 1- and 2-in. mikes and learn everything about them. Their progress was slow, but thorough lathe work was restricted at first to pull-test bars for the lab. or miscellaneous simple parts for maintenance—and they got the oldest

Representing a new development, WELDON Stub Arbors are specially designed to be used in place of the longer, unwieldy, conventional type of milling machine arbors. They can be handled with greater ease and convenience. At the same time the initial cost is less.

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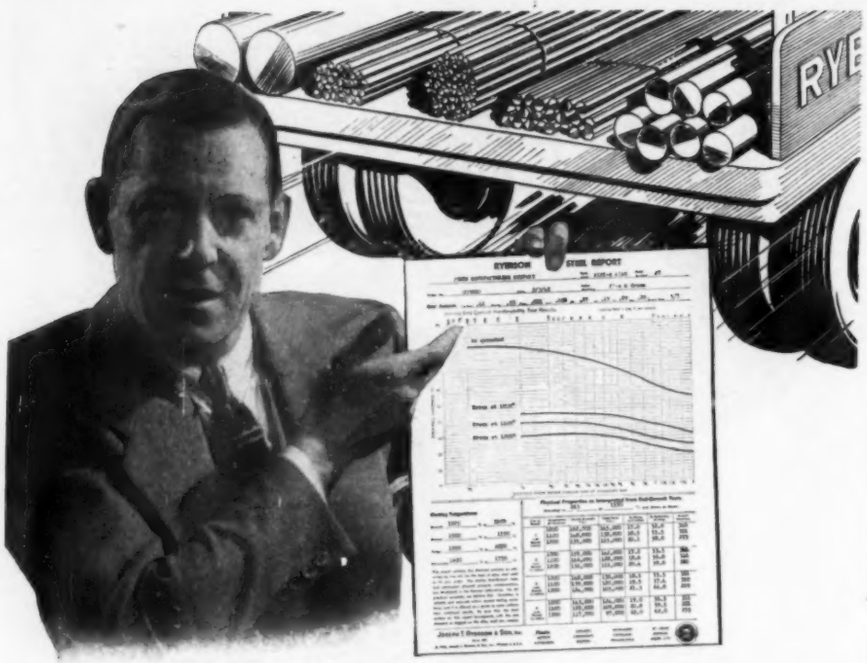

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machines in the shop. A new machine was for a man with seniority, who had the "feel," as had the craftsmen who had put something of themselves into its accuracy and perhaps unnecessary "frosting."

Now when new help is hired, with little or no experience at 65 cents an hour (top wages then) they are turned loose to commit mayhem on a $17,000 (or more expensive) machine. Normally a "boy" was permitted to make one tool or instrument a year on company time. To them, and to me, they were things of beauty. You could see the difference of first years from later ones, but only in finish, for the accuracy was always there. Each one had a story—how this one had been ground with only a few cuts at a time and then thrown out to age, then a few more cuts, etc.; how that one had been the result of some mistake in the heat-treating.

The boys would go on preferring to make than to buy. And I would back a man's personal set of plug gages, sine bars or mikes against a shop set every time, because I know darn well they haven't been used for spacers or as a clamp on some milling operation.

For "hammer mechanics" who load and unload automatic machines, whose technical skill is limited to reading mikes (as long as somebody doesn't turn them one full revolution), I say provide them with tools, but pay them accordingly. The day will come again when a man won't present himself and ask for tool or die makers', or even machinists' rates (which I hope remain high), unless he can produce a tool box worthy of his calling.

A. M. Elliott
LeRoy, N. Y.

•

The pride of ownership is a virtue if it is not carried too far, as, for example, better and more accurate tools being ignored just for the sake of using some favorite tool.

Today many companies are furnishing more and more tools to their skilled workers and finding that their investment in tools is paying off in time saved, plus the fact that the company thus keeps informed on the latest developments in tools.

One objection to company-owned tools is the fact that usually tool cribs are manned by apprentices or low-skilled help who are in no position to judge or test the accuracy of the tools which they dispense to the higher-skilled mechanics. They are also unable to determine if the tools are in proper operating condition when they are returned to them. If,

on the other hand, a competent man is available and can be charged with the responsibility of checking and adjusting all tools before they are allowed to be used again, then the system of company-owned tools would result in more accurate and more efficient work in that department.

Robert Knotek
University Heights, Ohio

"Quotes"

Industrial Teamwork

WILLIAM L. BATT, president, SKF Industries, Inc., blasted government controls in a speech recently. He cited the meat shortage as an example of rampant confusion and said it should focus attention on some fundamental economic laws. Excerpts from his talk follow:

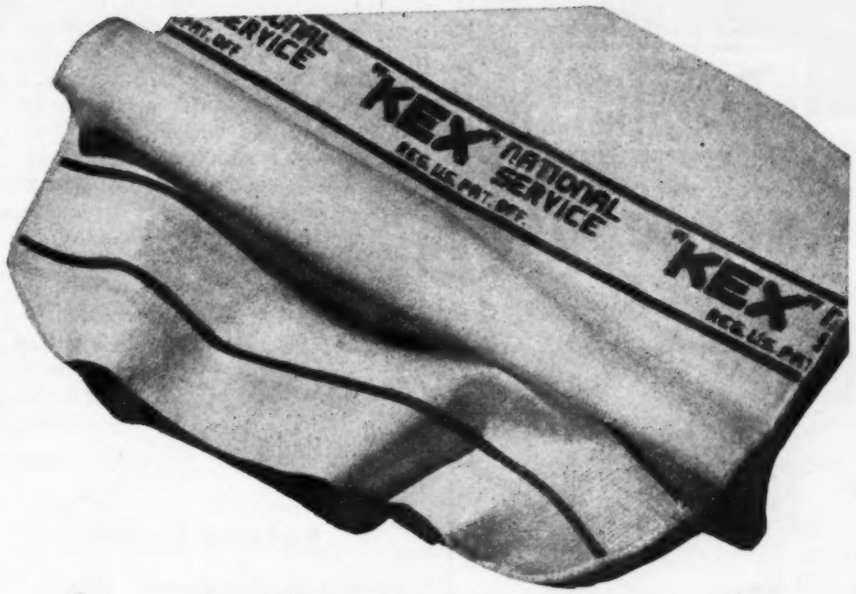
"In wartime, regulation of production and prices was inevitable. In no other way could the maximum effort of the nation be turned to winning that war, and such controls are possible in the overwhelming emergency of war because the people support them voluntarily.

"But when the emergency is over, we want to get back to peacetime ways as quickly as possible—and there comes the rub.

"When peacetime goods are in such short supply as they have been after this war, government is faced with difficult decisions. What everyone was anxious to avoid was such a rise in prices as to endanger the standard of living of the average American. For inflation is a dangerous and uncontrollable national economic force that carries ruin for labor and management alike in its wake.

"Such periods of adjustment call for statesmanship from all of us, for we may be tempted to make drastic decisions. . . . That is why it seems vitally important that all the people of this nation exercise the utmost self-restraint during this period of transition. . . .

"Selfish groups will seek to foment differences between the members of the American productive team. Men of sinister purpose realize that full production in America will wipe out all chance of advancing their plans for worming their way into control of the vast resources of America. We



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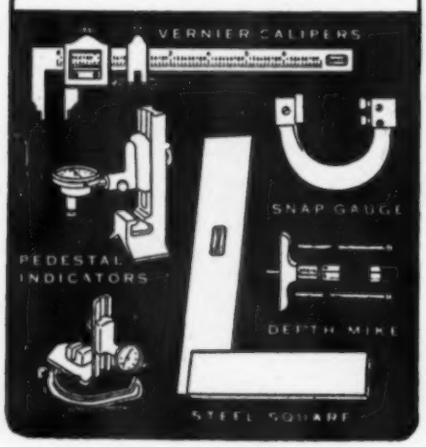

cannot let them succeed. To do so would be to admit an incompetence that is in itself foreign to the character of the individual American.

"Our honest differences can and must be settled without further dislocation of production. I see no reason why men and women who are members of the same productive team, who speak the same language, want the same things, enjoy the same things and share a common ambition to better themselves and their children should ever let themselves be split apart by economic gangsters—ideological thugs trying to machine-gun the orderly processes of our entire system."

•

Hardening Stresses

HAROLD A. STRICKLAND, JR., Chief Engineer, Induction Heating Division of Budd Co., said, at the 1946 semi-annual meeting of the American Society of Mechanical Engineers: "Stresses introduced by induction hardening may be favorable, unimportant or adverse. As an example of favorable stresses, one manufacturer of steam-hammer piston rods has found that an external induction heat-treat has improved fatigue life of these rods in excess of 200%.

"In another case, indicating less-favorable stresses, a diesel-engine manufacturer reports a reduction in endurance limit of from 10,300 psi. in an unhardened crankshaft to 7,700 psi. in an induction-hardened crankshaft. Although subsequent shot peening raised the endurance limit of the induction-hardened shaft to 10,800 psi., these examples indicate a range of experience with residual stresses.

"The stress pattern in a differentially induction-hardened piece is the result of purely mechanical phenomena and is due to the characteristics of the material and to the 'temperature — space — time' relationship to which its cross-section is subjected.

"The characteristic pattern of stresses in a differentially hardened piece is: (A) an outer hardened surface zone under compressive stress, (B) a transition zone adjacent to or under the hardened area in tension stress and (C) the balance of the material, either neutral or under compressive stress. In the inner zone C, the stresses balance in static equilibrium the stresses set up by zones B and A, and are frequently neutral or compressive.

"In zone B, stresses are tensile and are produced by heating and cool-

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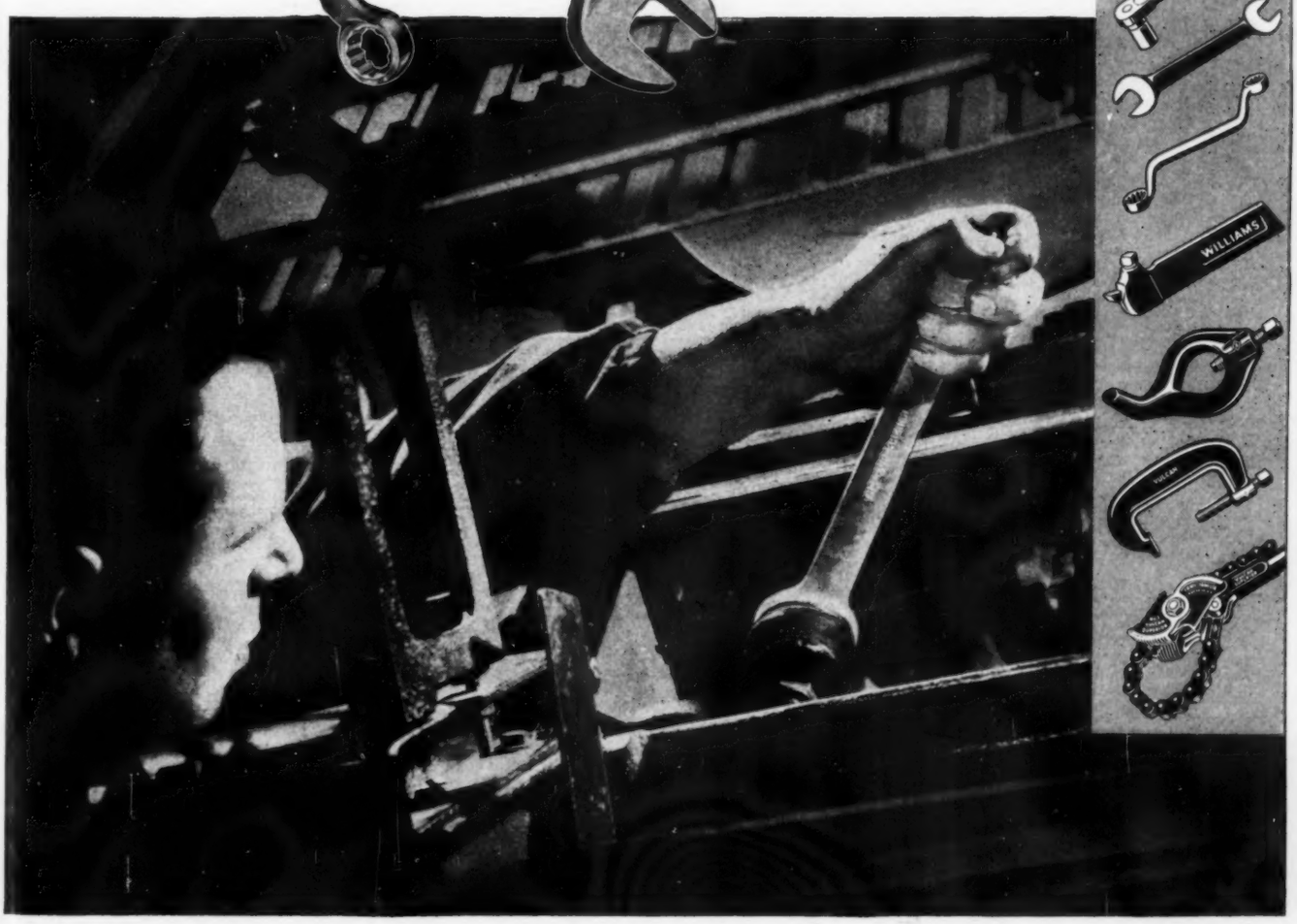

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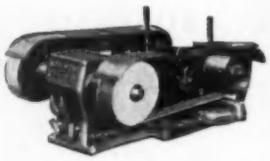

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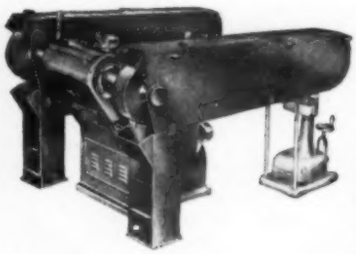
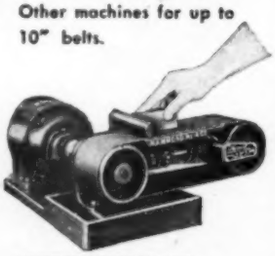


VARIABLE SPEED LATHE AND BACKSTANDS

Any speed from 1500 to 3000 RPM. Backstands can be purchased separately.



MODEL "400" WET-n-DRI, 4" BELTS Vertical or horizontal position. A popular belt grinder for finishing operations.

CARBIDE TOOL GRINDERS

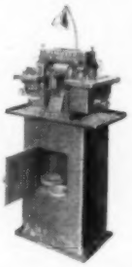
PRECISION BUILT MACHINES WITH NEW OUTSTANDING FEATURES

10" WET and DRY CARBIDE TOOL GRINDER

No Spray — No Splash Guards, Safety Cup discs and heavy construction for fast, efficient grinding.

CARBIDE TOOL AND FINISHING GRINDER MODEL 7

For rough and finishing small tools and diamond wheel finishing of all size tools.



HAMMOND PRODUCTS CARBIDE, GENERAL PURPOSE & ABRASIVE BELT GRINDERS • AUTOMATIC & CYLINDRICAL FINISHERS • POLISHING LATHES

Hammond Machinery Builders INC

1618 DOUGLAS AVENUE • KALAMAZOO 54, MICHIGAN

ing. A temperature increase causes the heated zone to attempt to expand and, at the same time, reduces its strength. As the depth of the heated zone is small, it is the weakest zone in the system and must therefore upset as its yield strength is exceeded. Upon cooling, the heated material shrinks without fully regaining its former length, leaving zone B in tension. Tension is also induced in zone B by the compressive stresses normally present in zone A.

"Zone A is generally in compression because of the increase in volume caused by the formation of martensite upon quenching. Although zone A is subject to even greater upsetting than zone B on heating, the dilation change upon martensite formation is great enough completely to dominate in this zone. Compressive stresses in this zone may also be fostered by the possible added upsetting of zone B by an external quench, but this effect is slight, if existent at all.

"Adverse stresses are usually encountered in a zone-hardened piece, because in this type of pattern the transition zone must appear somewhere on the surface of the piece. The presence of this zone, which is normally in tension, constitutes a surface weakness which should be either designed into a non-critically stressed area or corrected in some other fashion. Even when a surface-hardened piece is hardened all over, the tension zone may cause fatigue difficulties under high stresses if it is not far enough below the surface.

"In general, the higher radial temperature gradients during heating cause higher tensile stresses to be introduced. High temperature gradients are favored by high rates of power input, higher frequencies, large masses of back metal and low initial work temperatures. Heavy sections of back metal also induce higher tension stresses because the added section rigidity increases upsetting in the heated zone.

"Peak stresses can be reduced by tempering at a maximum stress relieving temperature, by pre-heating before hardening to minimize temperature gradient, by deep pattern heat treating, by cold working to reverse stress directions, by reducing power and increasing the heat time both to move the tension zone deeper into the work and to minimize the magnitude of this zone, and by quench delay to allow maximum time for fertile solution and therefore producing a maximum of martensitic zone.

"In all applications involving

For That Extra Edge In Production

Nelco Carboloy-Tipped Side Milling Cutters *(for Straddle Milling, Half-Side Milling and Slotting)* mill up to 20 times faster than old-style tools. In addition, these cutters produce many more pieces between grinds with a much finer finish.

Designed by craftsmen with custom-built precision that insures better production and workmanship, Nelco Side Mills have all-alloy steel bodies . . . thicker, sandwiched-brazed, diamond-ground tips that assure longer tool life and more regrinds.

These Nelco tools are copper or cadmium plated for quick job identification and to prevent rust: copper plated for steel and steel alloy jobs; cadmium plated for non-ferrous, cast iron and plastic material jobs.

All these extra features at no extra cost are found only in Nelco Carboloy-Tipped Side Milling Cutters . . . manufactured in sizes from 3″ to 8″ dia. and 1/8″ to 1″ width, and are available from stock. All Nelco tools are shipped individually protected by a plastic coating.

On Request!

Your copy of this new 28-page catalog illustrating and describing the complete line of Nelco Carboloy-Tipped Cutting Tools. Includes valuable engineering data and price lists. Send for it today.

NELCO TOOL CO., INC.

For That *EXTRA EDGE* In Production

Executive Offices and Plant

370 Hamilton Avenue, Dept. 4, Brooklyn 31, N. Y.

Any One of These Well Known Distributors Will Be Glad To Serve You

Albany—Sager-Spuck Supply Co., Inc.
Baltimore—L. A. Benson Co., Inc.
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Buffalo—Beals McCarthy & Rogers, Inc.
Cambridge—Robert E. Morris Co.
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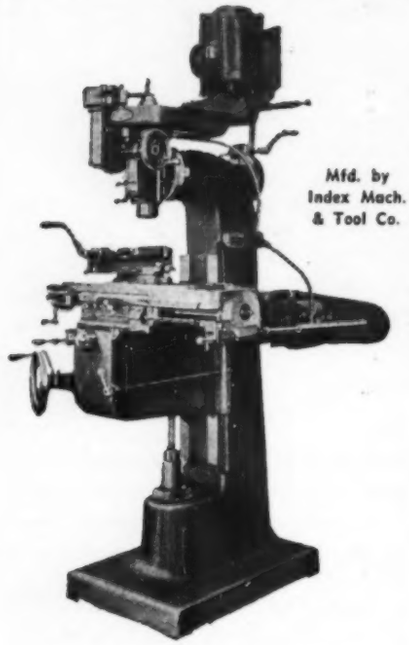
Cleveland—J. W. Mull, Jr.
Detroit—B-H Tool and Supply Co.
Detroit—Booth & Shaw
Indianapolis—J. W. Mull, Jr.
Los Angeles—Murphy-Denis Corp. of Cal.
Monroe, N. C.—Tool Service Engineering Co
Newark—A. N. Nelson, Inc.
General Carbides Co. Div
Philadelphia—Carey-McFall Co.
Pittsburgh—J. W. Mull, Jr.
Providence—Providence Mill Supply Co.
Rochester—Beals McCarthy & Rogers, Inc.
Syracuse—A. V. Wiggins & Co.
Toledo—J. W. Mull, Jr.
West Hartford—Robert E. Morris Co.
Worcester—Brierly, Lombard & Co.
York, Pa.—L. A. Benson Co., Inc.

INDEX MILLS

will help you on your tool, die and production work. In addition to micrometer dials on screws, verniers are standard equipment for cross and longitudinal locating. If finer precision is desired, rods and indicators are available. These in conjunction with power feed to a precision ball bearing spindle make a very versatile machine for milling, drilling and boring. *Literature promptly mailed on request.*



Mfd. by Index Mach. & Tool Co.

12" Tool Room Rotary Table

A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

BLANK and BUXTON MACHINERY

3100 E. MICHIGAN AVE.
JACKSON, MICH.

severe fatigue conditions, stress patterns should be carefully reviewed to determine the possible beneficial or detrimental effect of the pattern. In some cases, preliminary heat-treatment to effect an increased yield strength may reduce the effect of high-tension stress concentrations."

SEEN and HEARD

BY JOHN R. GODFREY

To Scrape or Not to Scrape?

WE HAVE COME a long way since the days when we scraped the main bearings of automobile crankshafts and similar work. And many still look at a spotted flat surface as being the sign of a good machine. But we all admit that scraping a bearing is an admission that the machining is a little less than perfect. A few well-known machine builders have not scraped the ways of their machines for years, but most of them "spot" the ways to please the customers.

One builder of fine machines asks a very pertinent question, however. Says he: "We know our finishing planers are in good condition and do a good job. But how long will they stay that way? Isn't it easier for us to do what little scraping we do on our machines, than to tear down our big planers and scrape their ways at frequent intervals?" And what about the makers and users of granite surface plates? They cannot be scraped!

•

Variable Speeds

VARIABLE-SPEED devices for controlling the speed of machine-tool and other spindles have attracted the inventive genius of thousands, and over a long period. Friction disks, various combinations of gearings, and hydraulic mechanisms of many kinds, have all made attempts along this line, both for machine tools and motor vehicles. Now these seem to be made unnecessary by the new method of using electronic tubes, or valves as our British friends call them, and with some reason, to control the current in both the armature and field of electric motors. This new development seems to have such great possibilities in the way of securing the desired speeds that the other methods may be on their way out.

Tax Old Machines Out of the Shop?

SOME SHOP owners have funny ideas about depreciation of their machine equipment. I've known men to contend that their 20- or 30-year-old machines were as good as new. Hadn't they put in new bearings and scraped the ways so they were in line? They discounted the advantages of the improvements made since their equipment was built. If a new machine will do twice the work, their machine has depreciated 50%. Here is where obsolescence comes in. For even if the 20-year-old machine had never been used, it would still be only half as efficient as the new one.

One of my friends suggests a novel method of getting old and obsolete machines out of the shop. Increase the taxation as they become less efficient! Instead of allowing a yearly depreciation as they grow old, impose a direct tax after they have their tenth birthday. Of course there are two sides to the question. In some small repair shop a 20-year-old machine may still be very useful. But it's worth thinking about as a means of improving the average of our shop equipment.

•

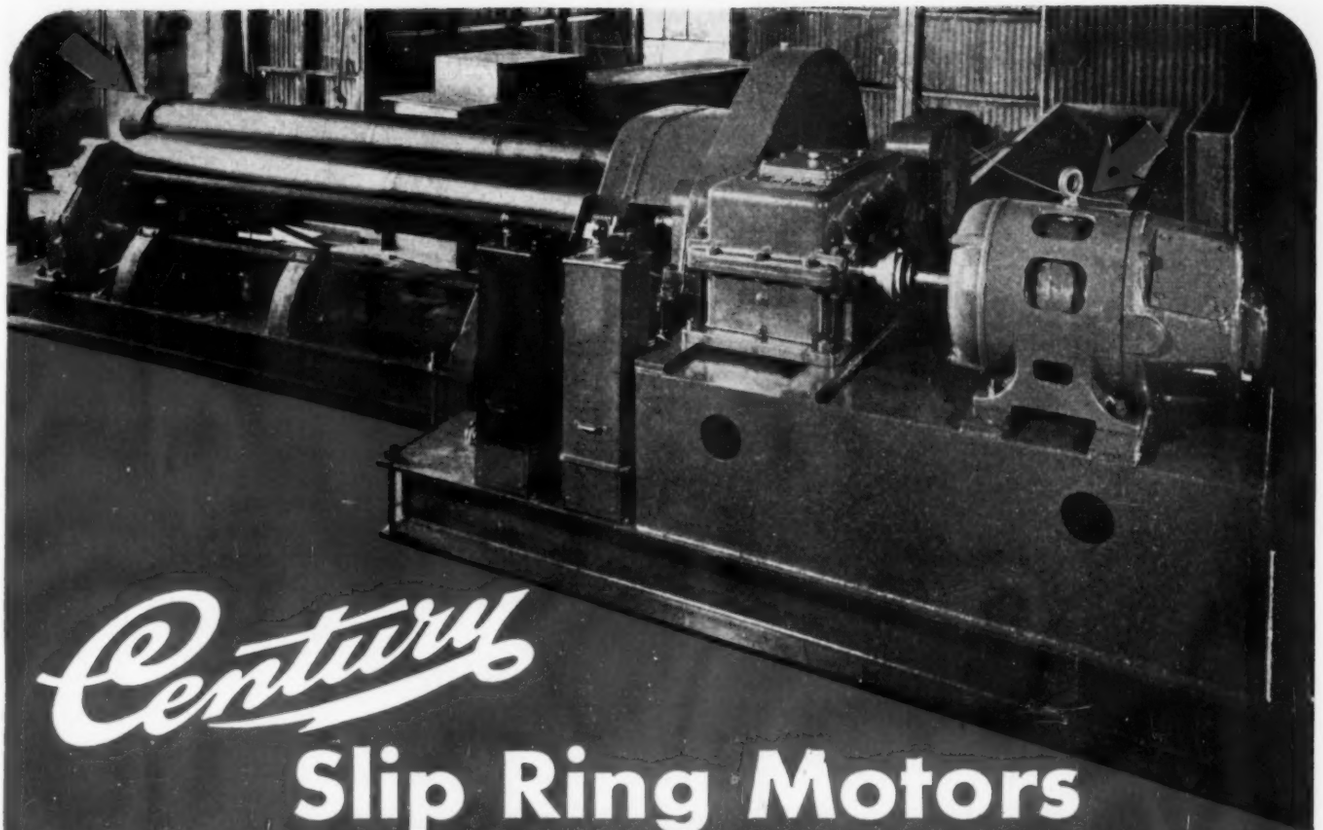
Cooler Cutting

ONE TOOL manufacturer is using grinding wheels approximately 7 ft. in diameter for roughing and finishing toolbits of heavy section. Wheels are built up of large segments fastened to a driving plate. Tools are held against the side of the wheel by hand. Purpose of the extra-large wheel is to avoid burning the tools. It seems that in fast, repetitive grinding of pieces, much heat can be stored up in the wheel. By making the wheel of large diameter, the temperature of the wheel is kept lower and it is cooler cutting. In fact, these wheels are successful although a 30-in. diamond-impregnated wheel was not. It takes about 1/2-hr. to get such wheels up to speed.

•

Anti-Dust Measures

DIRT ON VITREOUS enamelware can be prevented by avoiding *all* causes of dust. General air-conditioning of the shop is the first step. Auxiliary filtered-air outlets blowing into the shop can be installed at the entrance to spray rooms. The spray rooms should have adequate ventilating means and dust traps. And a water-wash sump under the return side of conveyors will remove accumulations of frit from conveyor fixtures.



Century Slip Ring Motors

Provide Maximum Performance for Bending Rolls

- Varying Torque
- Speed Regulation
- Low Starting Current

In the installation shown here two Century Slip Ring Motors have been correctly applied. A 20 horsepower Slip Ring Motor drives the plate rolls and a 7½ horsepower motor raises and lowers the rolls to regulate the curvature of the plate that is bent.

These motors have the ability to start heavy loads with a minimum of starting current and the speed of the motor may be controlled to compensate for varying thicknesses of metal plate.

Another advantage of Slip Ring Motors is that the direction of rotation may be readily reversed when application requirements make it necessary.

Century motors are built in a wide variety of types, in sizes from 1/6 to 400 horsepower to meet nearly every electric power requirement. Century motors are engineered to the requirements of the machines they drive to assure top performance. Specify Century for all your electric motor requirements.

Century C MOTORS

CENTURY ELECTRIC COMPANY - 1806 Pine St., St. Louis 3, Mo.

Offices and Stock Points in Principal Cities

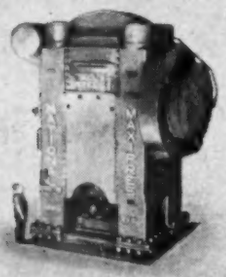
PRECISION

The above Caterpillar Side Bar Link is precision forged, flash trimmed, then coined on the original heat on National High Speed Forging Maxipresses.

Improved accuracy, increased output and impressive savings in materials and machining time are realized.

To explore the advantages of forgings made by the National technique, write for details or talk to a National representative.

★



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TIFFIN, OHIO.

DESIGNERS AND BUILDERS OF
MODERN FORGING MACHINES — MAXIPRESSES — COLD HEADERS — AND BOLT, NUT, RIVET AND WIRE NAIL MACHINERY

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Tear off here ATTACH TO YOUR LETTERHEAD AND MAIL TO EITHER COMPANY BELOW

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MONARCH STEEL COMPANY
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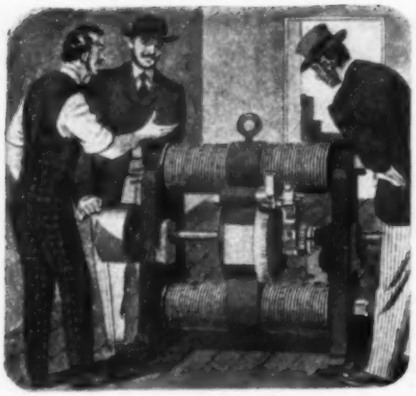
PECKOVER'S LTD., Toronto, Canadian Distributor

ACTUAL PHOTOGRAPH
Speed Case Steel (.20 carbon) 1 inch cold drawn bar tied in a knot, cold, without fracture.

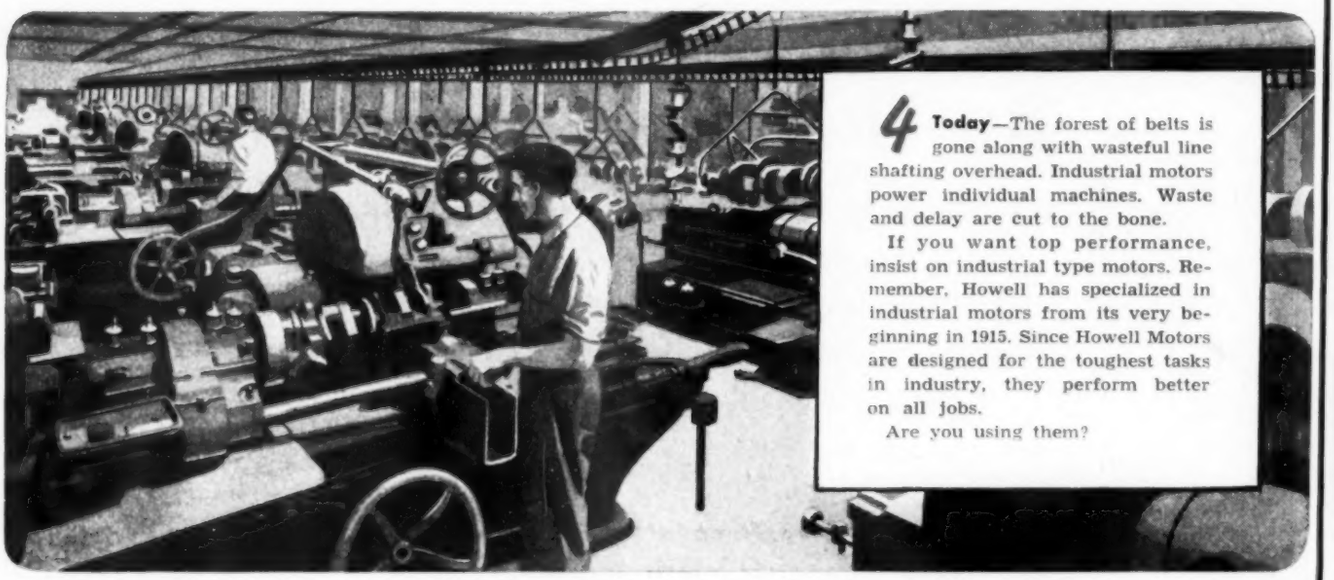


1 1870—The first electric motor was discovered by accident. Its invention revolutionized the lives of millions. Graphically, here's how its development changed you from a walker to a rider.

2 1897—The first automobiles were built by "hand." They were a luxury for the few. Mass production methods with batteries of electrically driven machines to cut manufacturing costs were still to come.

3 1925—Mass production had arrived. Machines driven by electric motors were more extensively used. Prices of cars came down. Walkers became riders. But shops looked like a forest of belts.

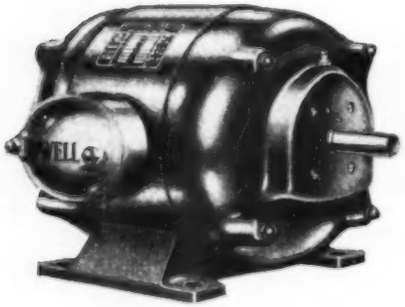
"Presto! and out went the forest of belts"



4 Today—The forest of belts is gone along with wasteful line shafting overhead. Industrial motors power individual machines. Waste and delay are cut to the bone.

If you want top performance, insist on industrial type motors. Remember, Howell has specialized in industrial motors from its very beginning in 1915. Since Howell Motors are designed for the toughest tasks in industry, they perform better on all jobs.

Are you using them?



Howell Protected Type Motors available in sizes 5 h.p. and smaller. Also other Howell industrial type motors available up to 150 h.p.

HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

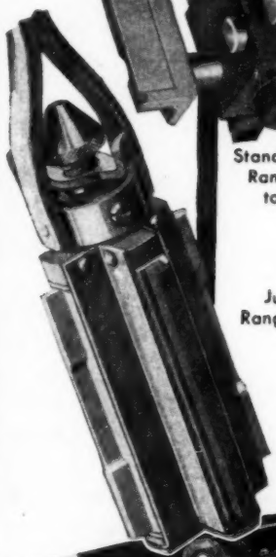
Manufacturers of Quality Industrial Type Motors Since 1915

On Cylinders from 2" to 14½" in Diameter

SUNNEN Portable Cylinder Hones

Provide Smooth Accurate Internal Finishes

Standard Model
Range 2 1/16" to 14½".



Junior Model
Range 2" to 2.6"

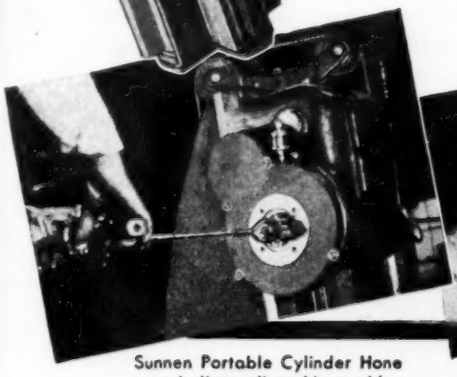
These hones provide a fast, easy, practical, economical way to produce internal finishes that are guaranteed to be accurate within .0005". Straight round holes are produced without disturbing previously established alignment. Sunnen Portable Cylinder Hones produce any commercially required finish with full bearing surface. They correct errors of out-of-round, taper, bell-mouth, wavy condition, distortion—and remove tool marks or other surface imperfections.

With Sunnen Portable Cylinder Hones stock removal is fast. They are portable, can easily be taken to the job. Free floating universal joint permits operating at an angle. Adjustment is simple, easy and positive. Easy to use, can be set up for operation in one minute. Handles any metal or plastic except lead and babbitt.

Sunnen Portable Cylinder Hones are ideal for *Selective Fitting of Mating Parts—Small Lot or Odd Size Production—Salvage and Production Repairs—Maintenance of Operating Equipment.*

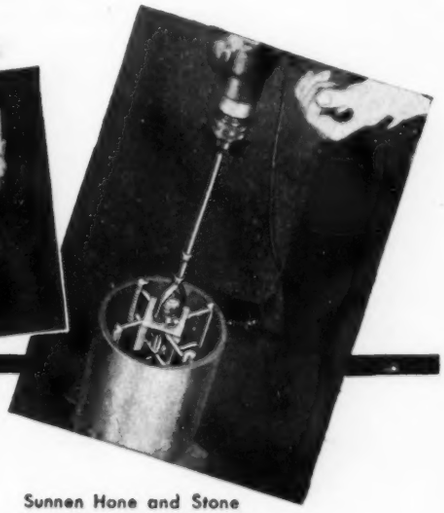
If you have an internal finishing problem, call a Sunnen Engineer —or write for free bulletin, form No. X-AN5001.

SUNNEN



Sunnen Portable Cylinder Hone saved dismantling this machine to install a new boring bar.

Portable End Clamping Fixture enables part to be honed accurately without distortion.



Sunnen Hone and Stone Support handles large diameter cylinders easily.

SUNNEN PRODUCTS COMPANY

7941 Manchester Avenue • St. Louis 17, Missouri

Canadian Factory: Chatham, Ontario

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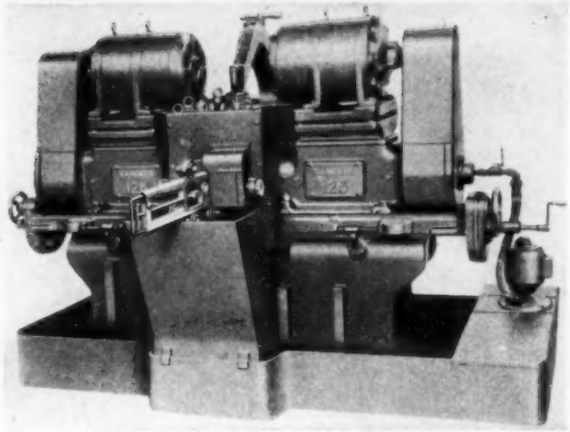
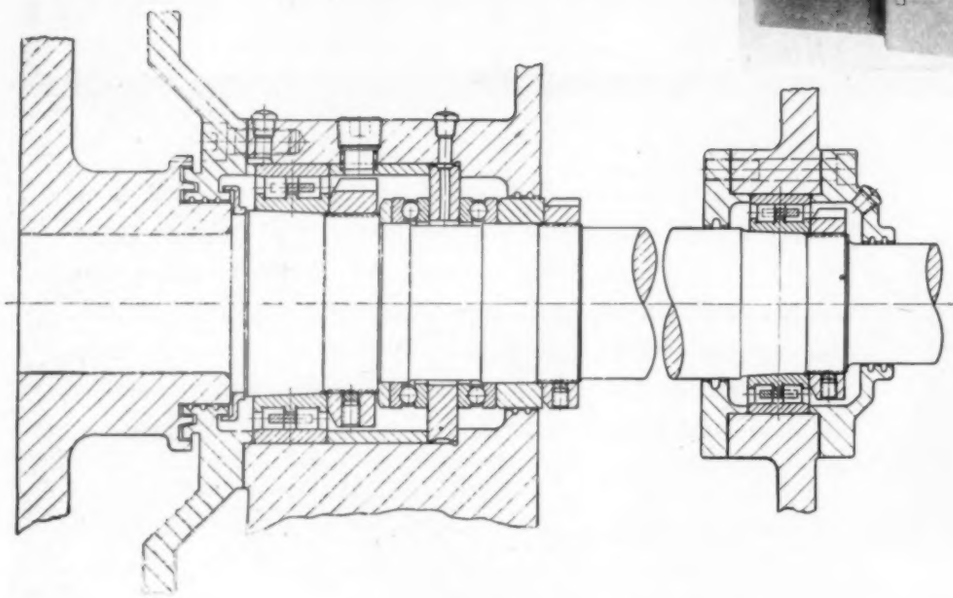
Precision Double Grinder built by GARDNER MACHINE CO.





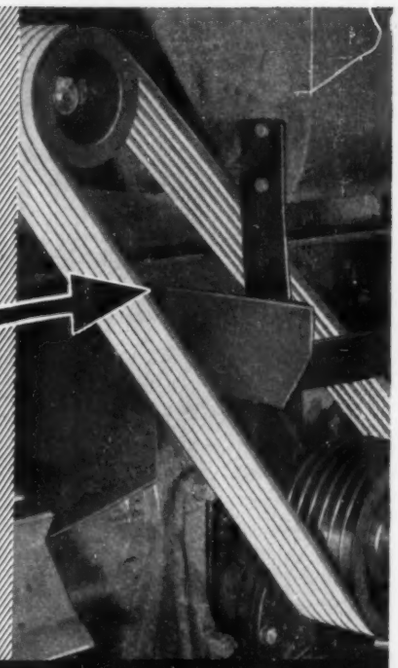
Its SKF Spindle Mounting.

THE SPINDLE MOUNTING FOR PRECISION!

Extreme accuracy of the Gardner Precision Double Grinder is made possible through the use of the SKF Spindle Mounting. This means ***rigidity*** because two SKF Ball Thrust Bearings prevent axial movement . . . two rugged SKF Double Row Cylindrical Roller Bearings are individually adjusted to a definite preload required to assure fine ground finishes and long life. For further information concerning SKF Bearings in the Machine Tool Industry, send for catalog, "SKF Machine Tool Spindle Bearings." 6192

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

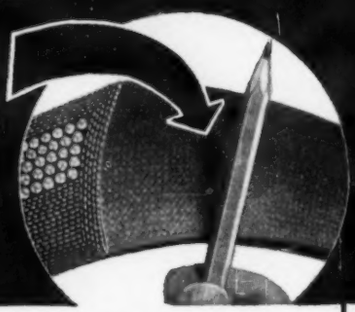
In *ANY* V-Belt It's the *SIDES* That Get the *WEAR!*



The moment you look at a V-Belt in its sheave you see at once that the *sides* of the belt do all the gripping on the pulley and get all the wear against the sheave-groove wall.

Notice, too—it's the *sides* that pick up all the power delivered by the driver pulley. The sides *transmit* that power to the *belt as a whole.* And then, once more, it's the sides—and the sides *alone*—that grip the driven pulley and *deliver* the power to it.

That's Why The FACT That the CONCAVE SIDE (A GATES PATENT) *REDUCES* Sidewall *WEAR* Is IMPORTANT to You!



The fact that the *side* is the part that does the work and gets the wear explains why you have always noticed that the sidewall of the *ordinary* V-Belt is the part that wears out *first.* Naturally, then, when you lengthen the life of the sidewall you lengthen the life of the belt.

The simple diagrams on the right show exactly why the ordinary, *straight-sided* V-Belt gets excessive wear along the *middle of the sides.* They show also why the Patented Concave Side *greatly reduces* sidewall wear in Gates Vulco Ropes. That is the simple reason why your Gates Vulco Ropes are giving you so much longer service than any straight-sided V-Belts can possibly give.

Longer Sidewall Wear Is NOW MORE IMPORTANT Than Ever Before!

Now that Gates Specialized Research has resulted in V-Belts having much stronger tension members—tension members of Rayon Cords and Flexible Steel Cables, among others—the sidewall of the belt is often called upon to transmit to the pulley much heavier loads. Naturally, with heavier loading on the sidewall the life-prolonging Concave Side is more important today than ever before!

THE GATES RUBBER COMPANY, DENVER, U. S. A.
World's Largest Makers of V-Belts

Straight Sided V-Belt

How Straight Sided V-Belt Bulges When Bending Around Its Pulley

You can actually feel the bulging of a straight-sided V-Belt by holding the sides between your finger and thumb and then bending the belt. Naturally, this bulging produces excessive wear along the middle of the sidewall as indicated by arrows.

Gates V-Belt with Patented Concave Sidewall

Showing How Concave Side of Gates V-Belt Straightens to Make Perfect Fit in Sheave Groove When Belt Is Bending Over Pulley

No Bulging against the sides of the sheave groove means that sidewall wear is evenly distributed over the full width of the sidewall—and that means much longer life for the belt!

471

GATES VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks **IN ALL INDUSTRIAL CENTERS** of the U. S. and 71 Foreign Countries

Gates
REG. U. S. PAT. OFF.
THE MARK OF SPECIALIZED RESEARCH

REDUCE COST
GET ALL BLADES
FROM ONE SUPPLIER

NO MORE expensive delays . . . no more costly experiments with blades that aren't *quite* right . . . the VICTOR supplier, backed by the *complete* VICTOR line can give you the blade you want — *whatever you want.* For the VICTOR line has the *right* blade for any and every job a hack saw or band saw can do — metal, plastic, or other non-metallic cutting. There's no more uncertainty about blade performance, either. For VICTOR blades, right down the entire line, cut faster, cleaner — cut blade replacement costs. See your VICTOR supplier. See how buying *all* blades from *one* source cuts blade costs *for you.*

2100 *Sold only through recognized distributors*

VICTOR

Victor Saw Works, Inc., Middletown, N. Y.
Makers of Hand and Power Hack Saw Blades, Frames and Metal Cutting Band Saw Blades

COOLANT SERVICE?

Here's Why It Will Pay You To Specify TUTHILL Pumps

For coolant service, you get performance features like these in Tuthill Model M pumps: Positive delivery. Self priming. Built-in automatic by-pass that protects against excessive pressure and allows small particles to pass through without serious injury to working parts. Capacities up to 50 g.p.m. Available in stripped form for direct incorporation into the design of the machine.

Write for Tuthill Model M bulletin

TUTHILL PUMP COMPANY
939 East 95th Street • Chicago 19, Illinois

Alloy Steel Service From Seven Warehouses!

AISI **HY-TEN** SAE

ALLOY STEELS

Cutting to length, Heat treating, Forging. Testing, Turning, Special Finishes. Prompt shipment of rounds, squares, flats, hexagons, octagons, and billets. Technical information and recommendations.

Write for our data sheet book.

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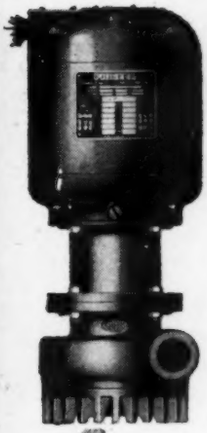
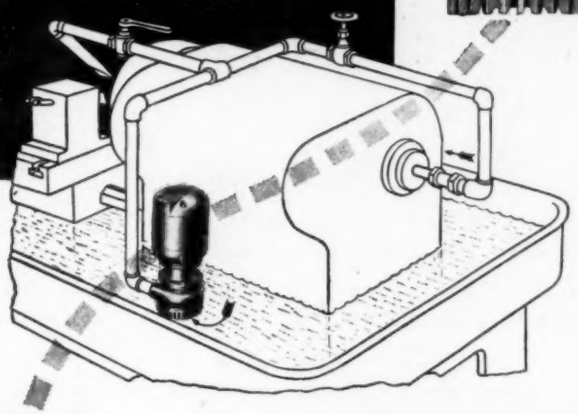
"Shorty"

WORKS IN SHALLOW TANKS





COOLANT PUMP MODEL "VS"
(Vertical Short)

Designed for Shallow Chip Pans Without Covers

Here is a performer with nine lives . . . it will give years of service . . . easily and quickly installed either with new equipment or as replacements . . . the inlet grille serves as a base, allowing the pump to rest directly on the bottom of the tank . . . clamps and holding brackets are not required.

400 STANDARD MODELS To Choose From.

Pioneer Pumps in Seal-type, Seal-less and Rollway designs for pumping coolants, cutting fluids, abrasive liquids, lubricants and water available in every type and size. Please describe your installation when writing for information.

Pioneer Pump & Manufacturing Co.
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ALLEN

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CAP SCREWS

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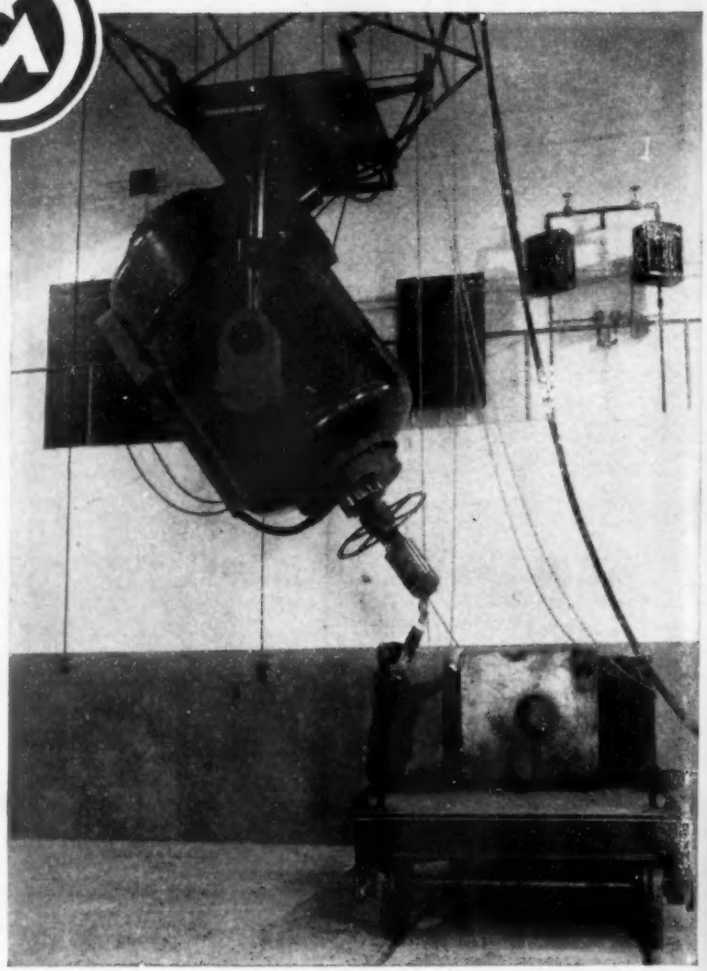

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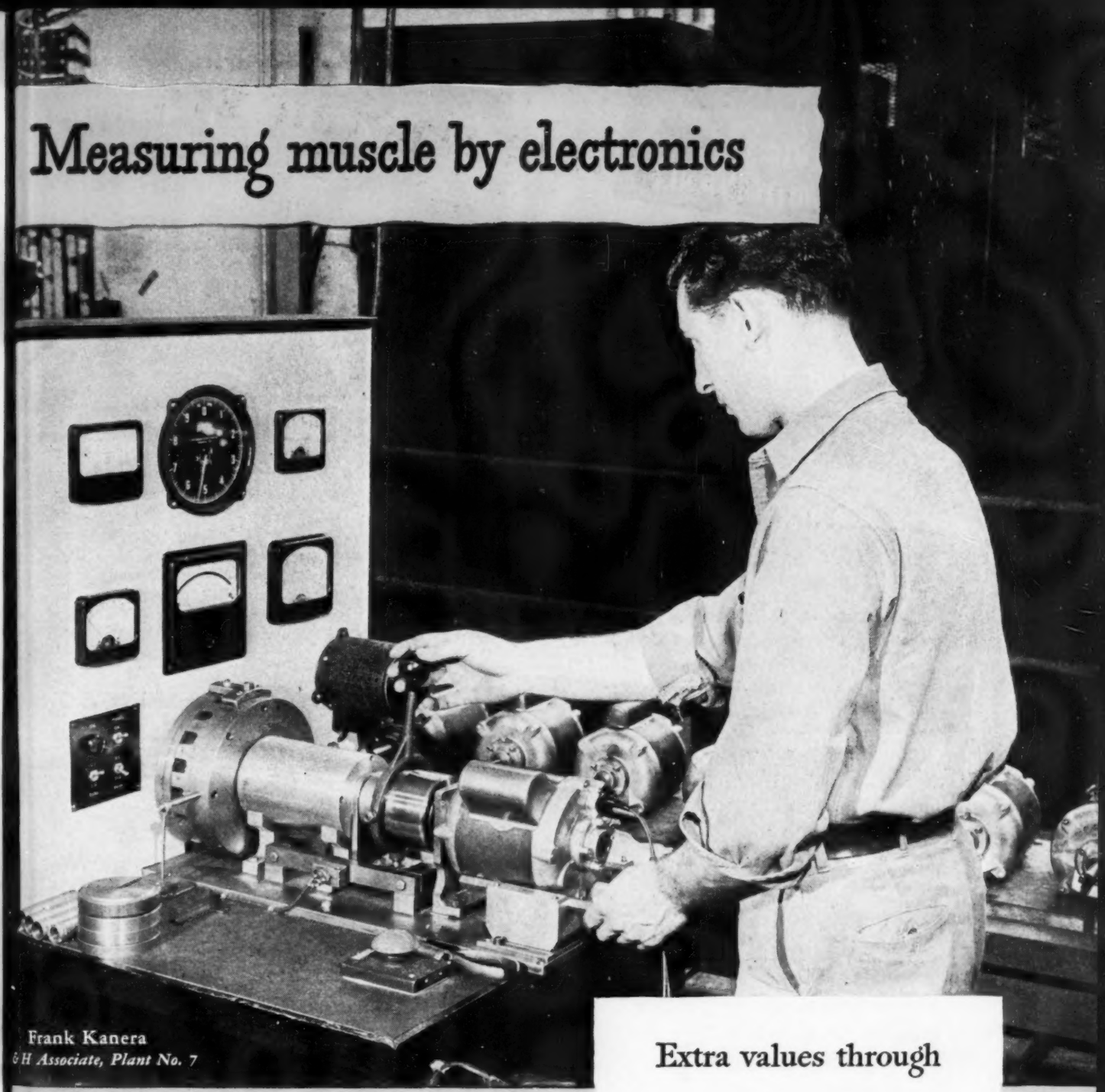

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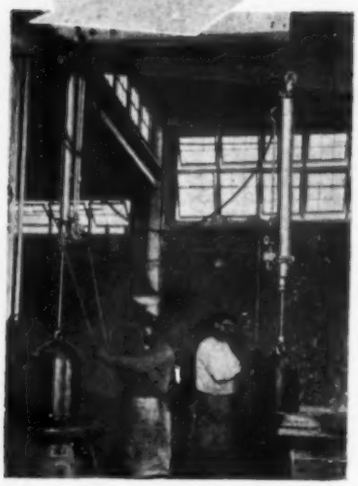

The Maurer Supply Co., St. Louis, uses Curtis Air Hoists to raise and lower parts in hot-dip galvanizing work. Among other advantages, they have found that the rigid rod in Curtis hoists eliminates swinging; that the positive control of loads is essential to such work and provides a maximum of safety to the operators. Working under severe conditions of acids and heat, these Curtis Air Hoists are giving "trouble-free service" and enabling this company "to perform an operation impossible without them."

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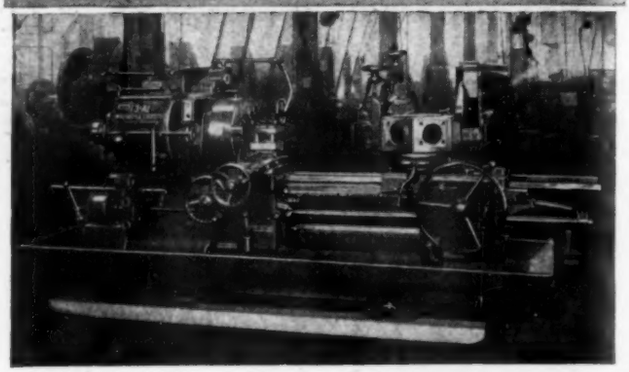

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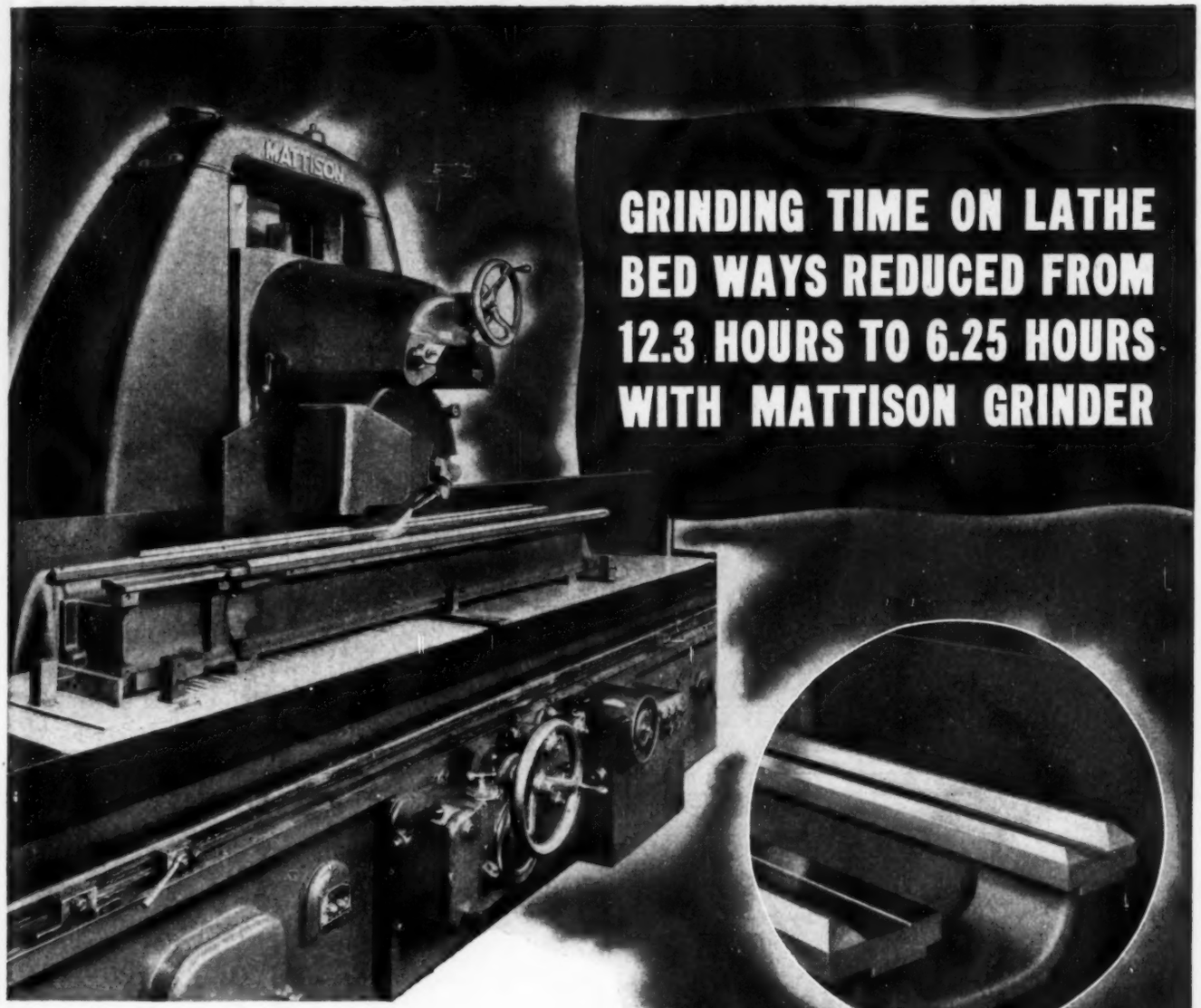

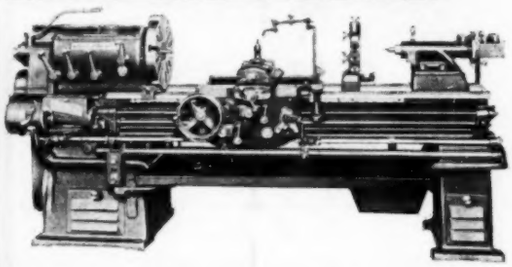

The job being ground on the Mattison Grinder is a bed for the Reed-Prentice Lathe shown above.

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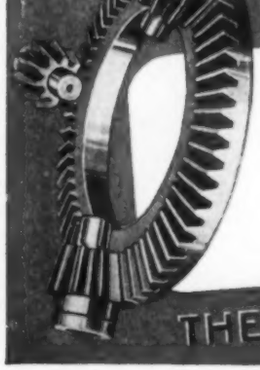

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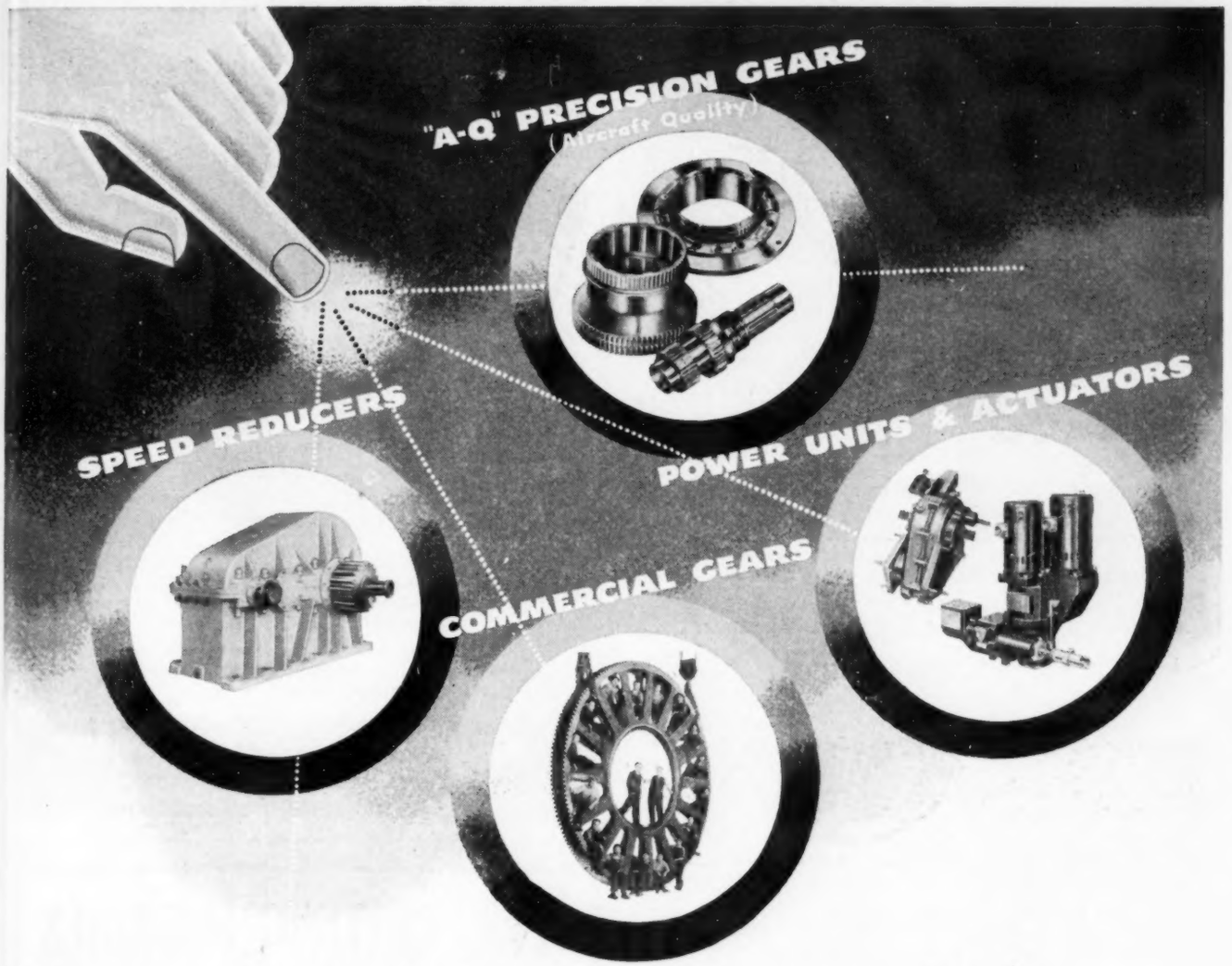

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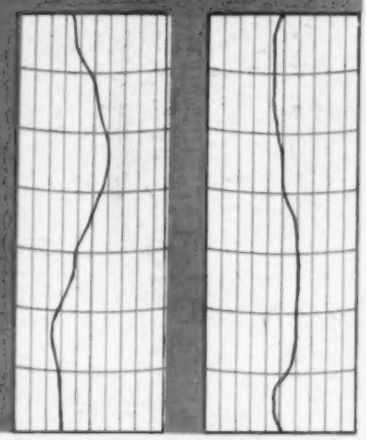

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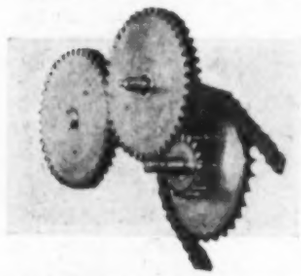

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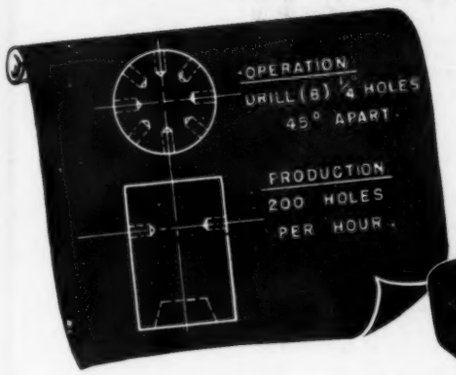

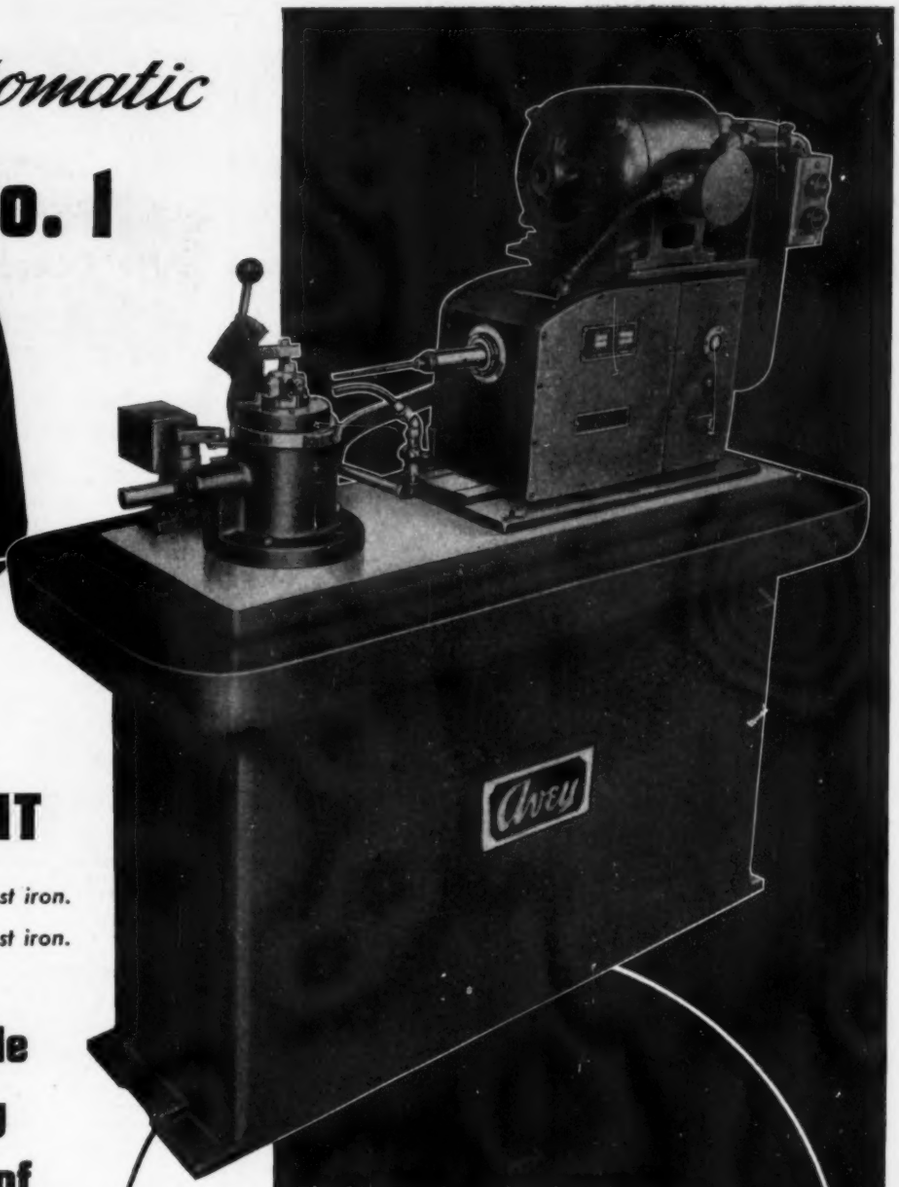

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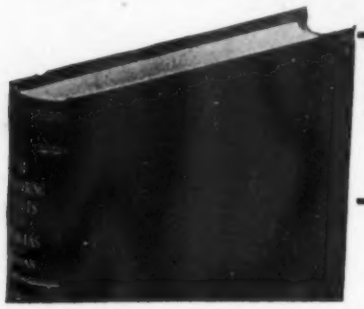

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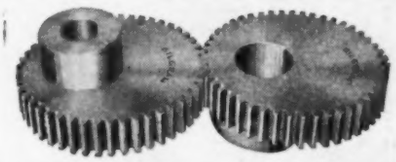

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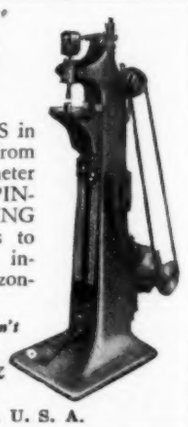

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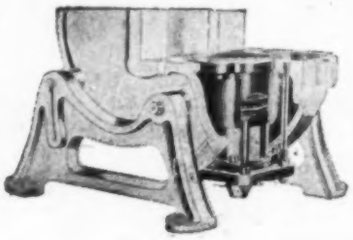

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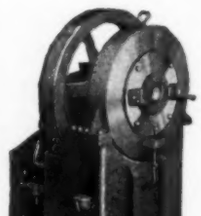

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Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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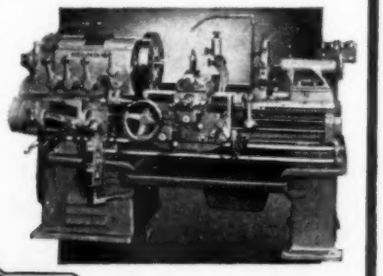
THE DYKEM COMPANY, 2301B North 11 St., St. Louis, Mo.
In Canada: 2466 Dundas St. West., Toronto, Ont.

REED-PRENTICE

LATHES
DIE CASTERS
DIE SINKERS
VERTICAL MILLERS
INJECTION MOLDERS



REED-PRENTICE CORP.
WORCESTER MASS. U.S.A.

Talide
(TUNGSTEN CARBIDE)

Drawing Dies

Talide Tungsten Carbide Dies outwear steel dies at least 20 times, and in many applications, the ratio is as high as 50 to 1.

Made from the hardest metal known, with great compressive strength, the wear on these dies after thousands of draws is almost negligible. Talide Metal needs little redressing, a factor which reduces down time by over 50%.

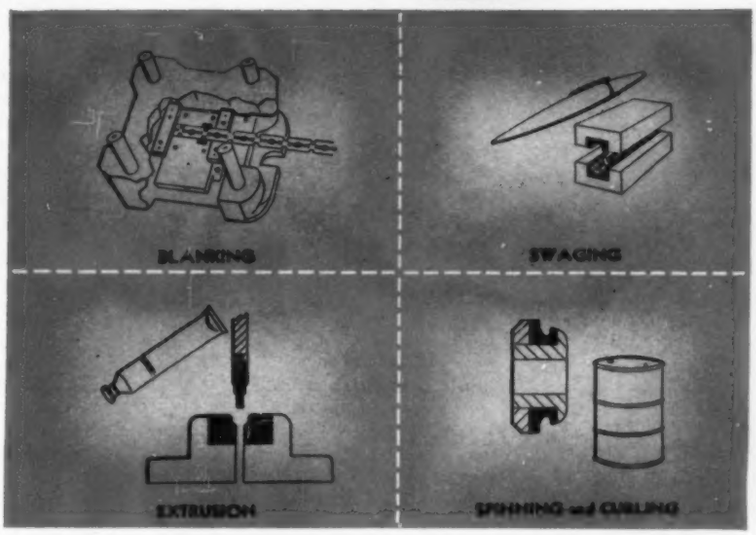
You can increase production, too, by taking much heavier drafts with Talide Dies, and by using the same Talide Drawing Die for two operations.

Talide Dies take and hold a brilliant finish, which imparts a better finish to your product and helps to eliminate scoring, galling, or pick-up. Scrap is reduced to practically nothing which increases by many thousands the number of pieces passing rigid inspection.

Original cost higher? Yes, but as for the advantages, the chief engineer of a prominent stamping plant has this to say:

"Our past experience proves to us that the original cost of Talide Dies is offset many times by the economy of long production runs."

Production men adapt Talide Dies for long production runs where steel dies wear out too fast or the service is too severe. See the illustrations here of typical applications of blanking, swaging, extruding, spinning and curling. The applications are almost endless. Write us about your particular application.



TALIDE METAL *meets every requirement*

★ *Send for Die and Wear Part Catalog 46-WP.*

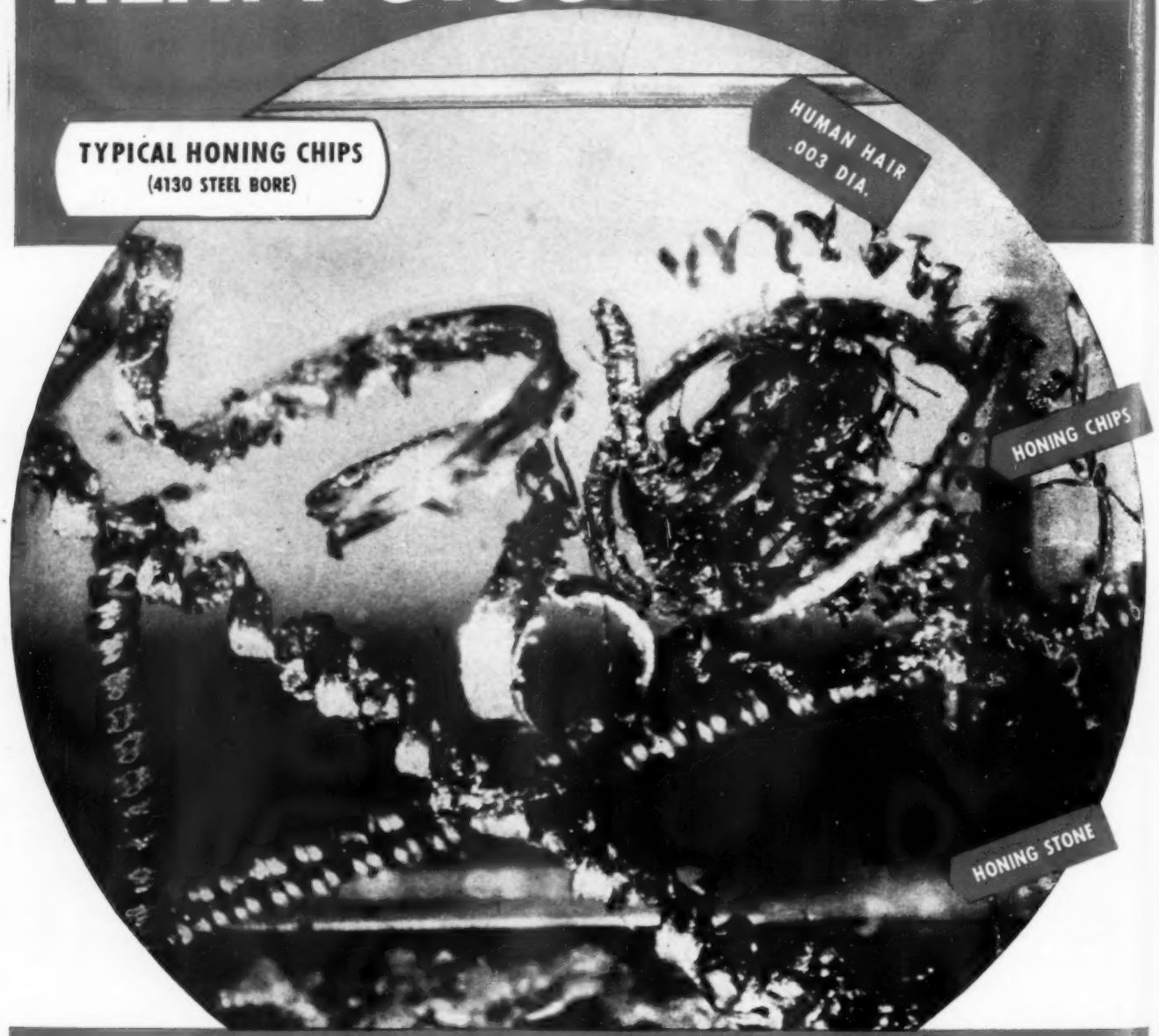
SINTERED CARBIDES
MC TALIDE
HOT PRESSED CARBIDES

METAL CARBIDES CORPORATION

YOUNGSTOWN 5, OHIO *Pioneers in Tungsten Carbide Metallurgy*

CUTTING TOOLS · DRAWING DIES · WEAR RESISTANT PARTS

FOR HEAVY STOCK REMOVAL



Microhoning is a METAL REMOVING production operation

These chips are evidence that honing is a positive shear-cutting operation, capable of removing metal under adjustably controlled actuation. Whether used for removing only the "fuzz" or "scarf" of some other prior operation, or for chewing out a lot of stock either from green, or from a hardened bore, microhoning is usually the better, quicker, lower cost method for high production.

Microhoning now combines several new developments to remove a lot of metal so economically that intermediate machine operations can frequently be entirely eliminated. For example: Micromatic Additive Treatments of Honing Stones now accomplish from 200 to 400% increased production, per set of stones in most applications.

HONING MACHINES, HONING TOOLS, HONING FIXTURES AND HONING ABRASIVES

MICROMATIC

DISTRICT FIELD OFFICES: 1323 S. Santa Fe, Los Angeles 21, California, Phone: Tucker 3756 • 194 Dalhousie St., Brantford, Ont., Canada, Phone: Brantford 1128 • 616 Empire Bldg., 206 So. Main St., Rockford, Ill., Phone: Forest 1128 • 501 Harries Bldg.,

MICROHONING

is the Quicker, Better, Lower-Cost Method

A DIESEL FUEL INJECTOR BODY
.375" DIAMETER x 2½" LONG

1st Honing Operation—in the "green" —Removes an average of .012" in 65 seconds.

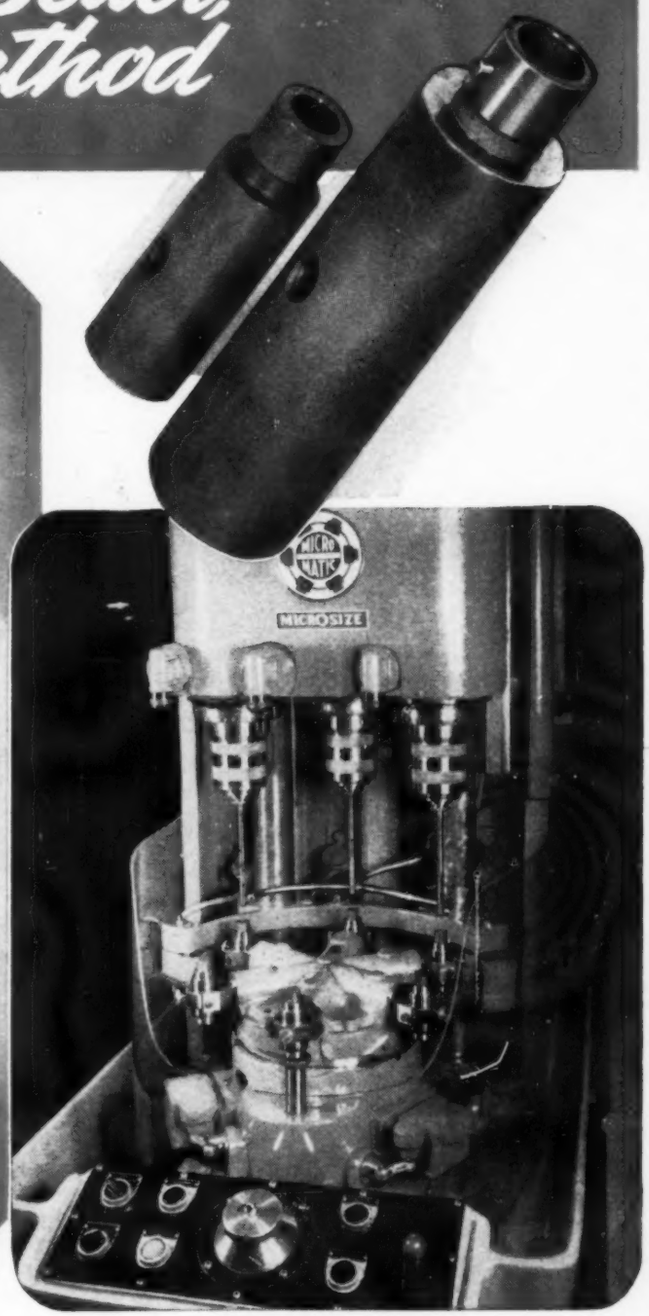
Part is then Nitrided to 70-72 Rockwell C.

2nd Honing Operation Removes an average of .0015" in 60 seconds.

Roundness and taper is held within .0001".

Bow is held within .00007".

Microhoning speeds operation in final machining of either green or hardened parts.



HONE CORPORATION DETROIT 4, MICHIGAN

137 No. Main St., Dayton 2, Ohio, Phone: Hemlock 8261 • 927 A—M & M Bldg., P. O. Box 981, Houston 2, Texas, Phone: Preston 2381 • Room: 514—129 Church St., New Haven 10, Conn., Phone: New Haven 7-0035.

START THE NEW YEAR

Right

No. 2-20 Milling Machine
Table, 42" x 12"
Table travel, 20"

Today—it's more important than ever to keep milling costs down and production UP—by using the *right* machines! Get set now for the new jobs with modern Kent-Owens Milling Machines! They're engineered for utmost *accuracy, speed* and *dependability*... assuring steady output without costly downtime. Simple... practical... efficient ... ruggedly built.

The Kent-Owens Standard line includes a wide range of hydraulic and hand operated machines. Let a Kent-Owens engineer recommend machines and tooling best suited to your requirements. Write today for further information. Kent-Owens Machine Co., Toledo, O.

Call on

KENT-OWENS

for Milling Machines

KENT-OWENS REPRESENTATIVES

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Neff, Kohlbusch & Bissell

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DAYTON
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INDIANAPOLIS
Oasis-Booth Machinery Co.

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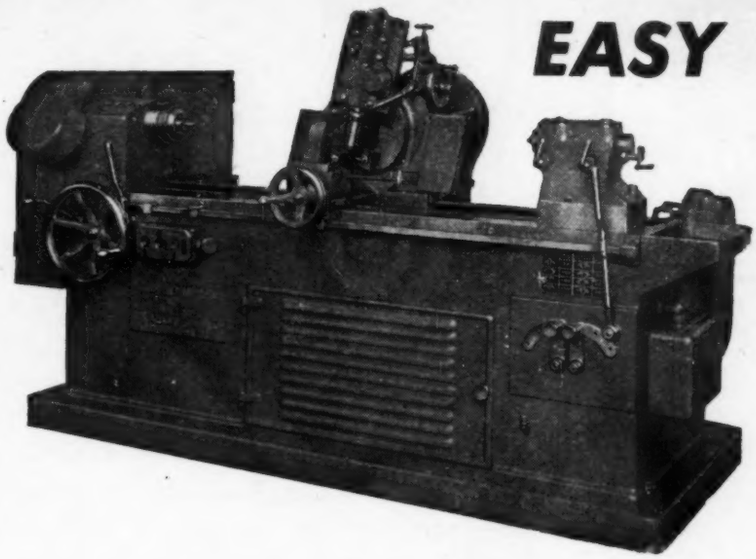
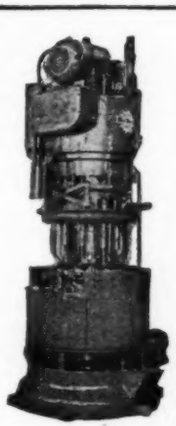


EASY TO CONTROL • HIGH PRODUCTIVE ABILITY • •

The Adams Gear Hobber and Thread Miller, made in two sizes, is known for smooth and rapid operation, great durability, and enduring accuracy and alignment.

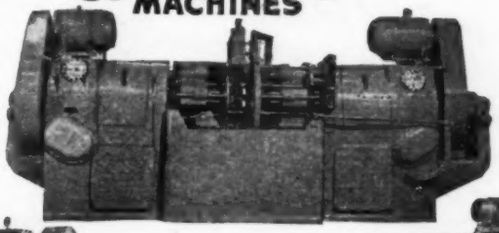
For complete description, write for literature.

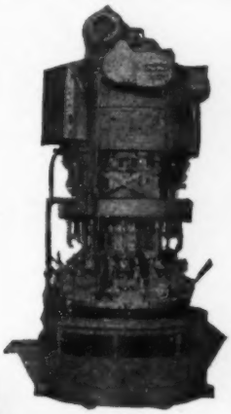
The ADAMS Company
DUBUQUE, IOWA
ESTABLISHED 1883

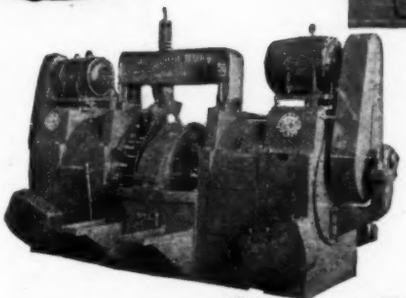


Roto-Matic Drilling MACHINES

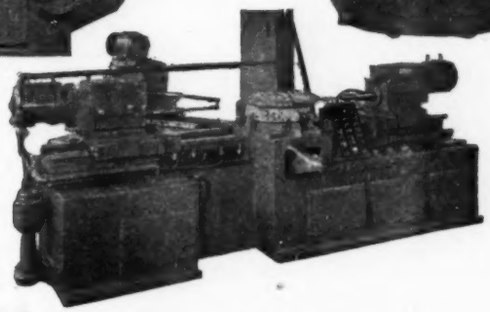
VERTICAL AND HORIZONTAL TYPES







MULTIPLE SPINDLES

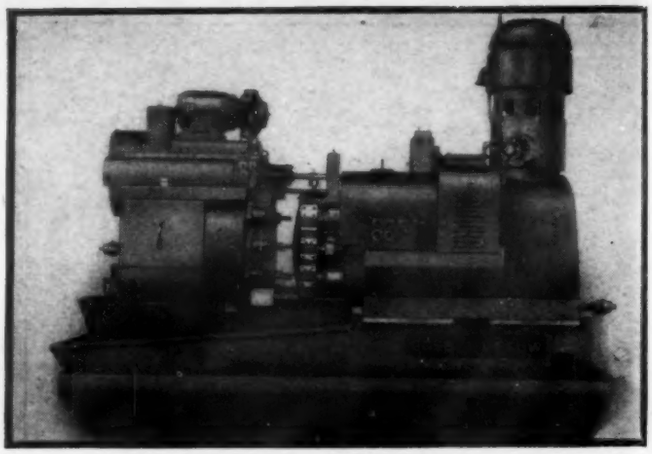


Highest Production — Low Maintenance

MILLING • DRILLING • REAMING • BORING • PIPE THREADING • SPECIAL MACHINES

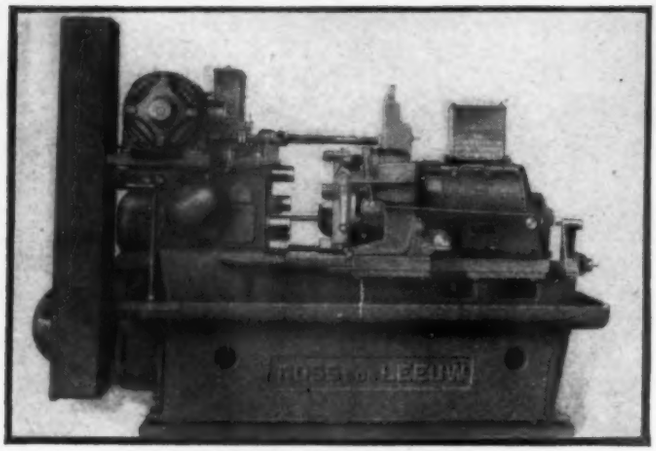
DAVIS & THOMPSON COMPANY
MANUFACTURERS: MACHINE TOOLS, MICROMETERS AND GAGES
MILWAUKEE WISCONSIN

GOSS & DE LEEUW
Multiple Spindle
CHUCKING MACHINES



WORK ROTATING TYPE

5 spindles • 6 Spindles • 8 Spindles



TOOL ROTATING TYPE

4 Spindles • 5 Chucking Positions

Both types of machines provide lead screw threading. Oversize spindles on these machines are mounted on pre-loaded anti-friction bearings. Ways are hardened; gears are of chrome-nickel steel, carefully heat-treated.

The many modern features offered in these machines are fully described in catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

PRECISION REID SURFACE GRINDERS

REID'S PRECISION MANUFACTURING for over 46 Years Is Your ASSURANCE

IT'S PROVEN!

The "Know How" experience gained over this long period is built into every REID PRECISION SURFACE GRINDER.

BECAUSE OF
DEPENDABLE ACCURACY
ECONOMICAL PRODUCTION
CONTROLS AT YOUR FINGERTIPS

Leading shop men everywhere say,

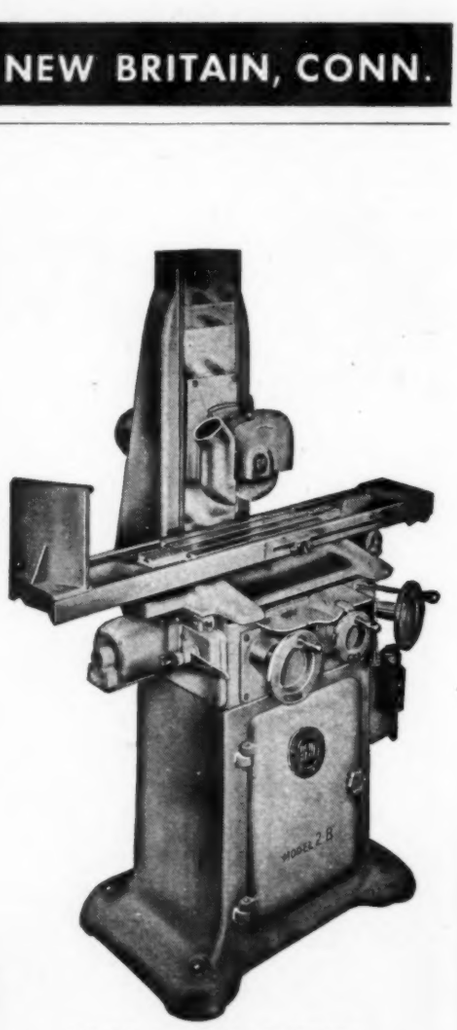
"for Close Tolerance, use a REID!"

The Reid Model 2-C Hand-Feed also is an exceptionally fine machine for tool, gage, die and certain production grinding. Machines equipped for wet grinding if required.

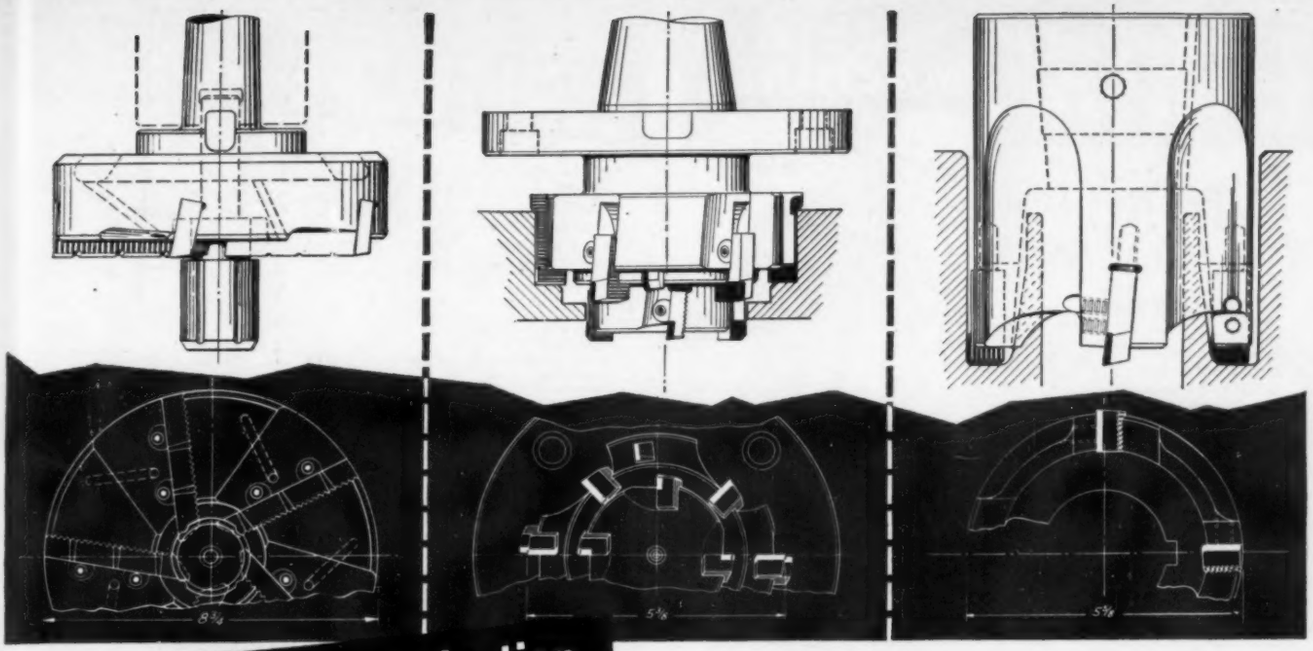
EXCELLENT DELIVERIES—Distributors in All Sections.

Write to Dept. H for illustrated bulletin and prices.

REID BROTHERS COMPANY, INC.
BEVERLY MASSACHUSETTS



Model 2-B ALL-ELECTRIC



Put Teeth into Production

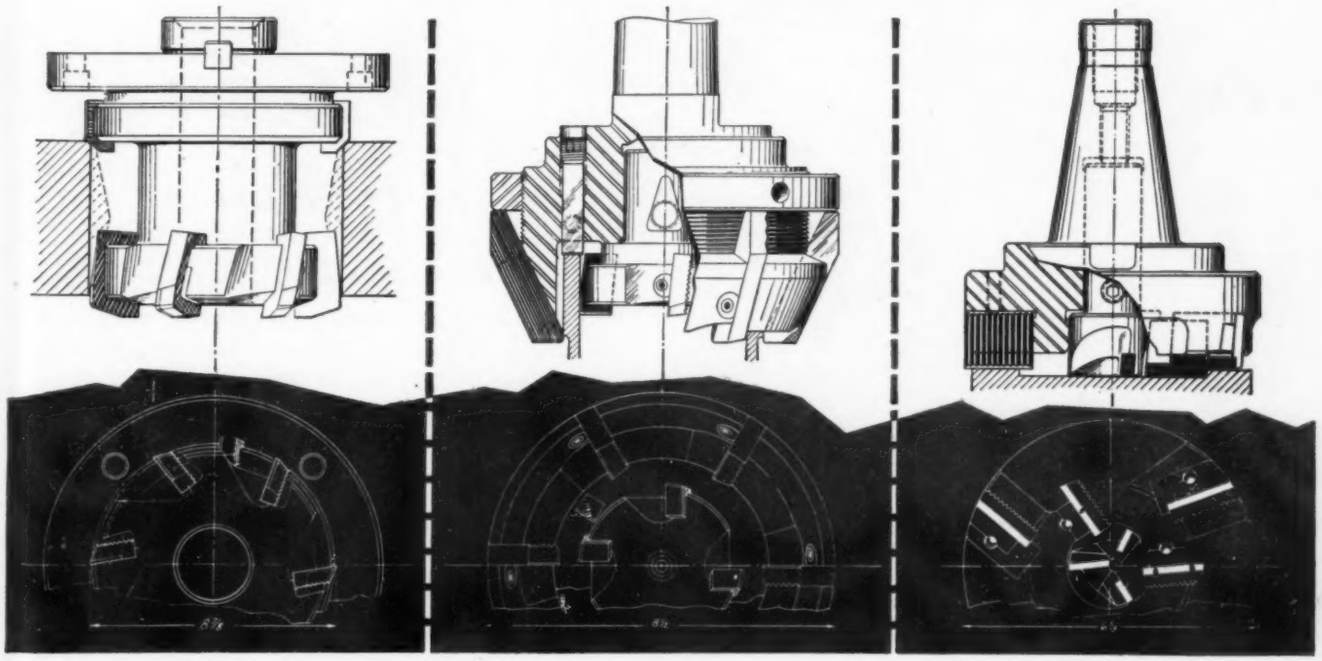
Gairing inserted blade cutter-heads combine simplicity, rigidity, and adaptability (multiple operations in one head) with ease and speed of adjustment.

Greater rigidity increases their ability to take heavier feeds. They provide solid, positive, independent support to the blades which may be of high speed steel, hard alloys, or tungsten carbide. Blades are designed with correct angle, positive or negative rake, and proper projection of the blades from the body. They are replaceable at a fraction of the cost of solid tools.

Gairing cutter-heads efficiently combine several cutter operations in one tool because the relation of each cutting edge is easily maintained and perfect concentricity between diameters is assured. *Also*—and this is important: Setup time on machining operations involving close tolerances is greatly reduced.

Our Engineering Department will gladly discuss any heavy cutting tool problem you have.

THE GAIRING TOOL COMPANY, DETROIT 32, MICHIGAN



BURKE MILLING MACHINES

. . . Put Your Small Work on a Production Basis!

Those small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises—3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request — Write!

BURKE MACHINE TOOL CO.
CONNEAUT · · · OHIO

ENGINEERED EFFICIENCY

THE CINCINNATI name stands for more than fine electrical tools—it stands for ENGINEERED EFFICIENCY. That's why you can depend on THE CINCINNATI Electrical Tools for maximum production at minimum cost.

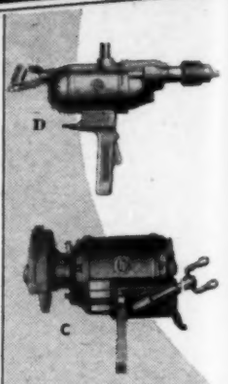
A BALL-BEARING PEDESTAL GRINDER—Designed and built for continuous production work and all general purpose grinding. Sizes: ¼ to 15 H.P.

B BUFFING AND POLISHING LATHE—Especially designed, ruggedly built, for continuous service under most severe conditions. Sizes: ½ to 15 H.P.

C TOOL POST GRINDER—With or without feed, especially adapted for grinding lathe centers, cutters, reamers, rolls, dies, etc. Can be used in shaper or planer for surface grinding. Sizes: ¼ to 1 H.P.

D STANDARD DUTY BALL-BEARING ELECTRIC DRILL—For general maintenance work in industrial plants, small shops of all kinds. Sizes: ¼ to 1¼ inches.

Write today for complete details.



The Cincinnati
ELECTRIC DRILLS · GRINDERS
BUFFERS · PORTABLE TOOLS
AIR MASTER DUST COLLECTORS
THE CINCINNATI ELECTRICAL TOOL CO.
Division of THE R. K. LeBLOND MACHINE TOOL CO.
2615 Madison Road, Cincinnati 8, Ohio

NATIONAL KEYSEATING MILLER

. . . the tool that converts drilling machines into key-seaters and saves time and money

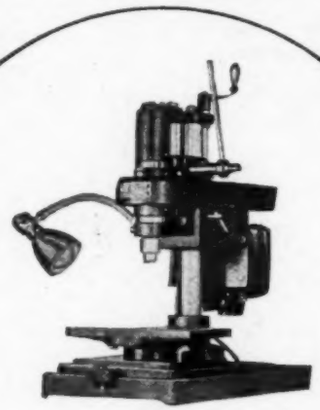
• With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on offset holes and blind holes. Work clamping is unnecessary. We also manufacture oil-grooving millers.

Made in twenty-seven different diameters from ½" to 3½". Several widths of cutters can be used in each size.

WRITE TODAY FOR OUR NEW CATALOG NO. 16

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO



FOR PRODUCTION

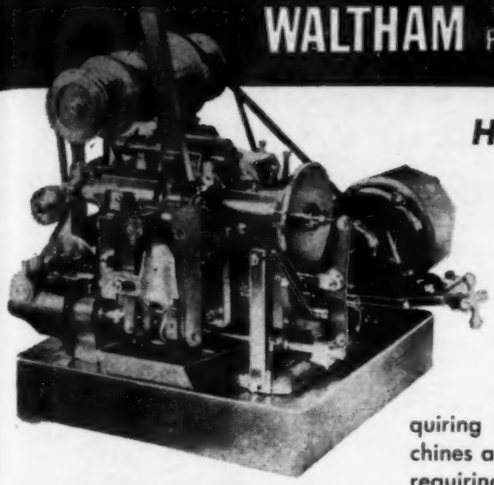
Specify Hamilton "Maxi-Jr.-E" Super Sensitive

DRILLING MACHINES

A "small hole" **production** drill supplying sensitive accuracy far beyond the usual requirements. Built for the finest precision work. (Drilling capacity .004" to 5/16" in all drillable material.) Built for intense production usage. "Takes" abuse . . . and maintains accuracy. Write for literature and prices. Address Department D-J.

THE *Hamilton* TOOL COMPANY
SUPER SENSITIVE DRILLING MACHINES · TAPPING MACHINES · PORTELVATORS
NINTH STREET AT HANOVER · HAMILTON · OHIO · U·S·A

WALTHAM PINION & GEAR CUTTING MACHINES

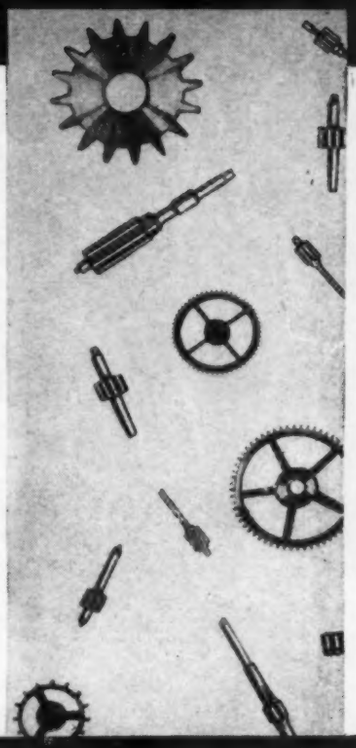


Highly productive—fast and accurate

These machines—made in single-cut, multiple-cut and magazine-feed types—are designed for the fast, precision production of gears and pinions for watches, instruments, fuses, etc. They are simple to operate, requiring no special skill. Magazine-feed machines are fully automatic, the other machines requiring positioning of blank and starting by hand.

Drive for these machines is either from countershaft or by individual motor. On motor driven machines, V-belts drive cutter spindle, worm shaft and pump.

Illustrated literature and detailed specifications are available promptly on request.



SPECIFICATIONS

PINION MACHINES

Diameter capacity, approx. ½"
Coarsest pitch about 32 D.P.
Strokes of Work slide for pinions—.24" to .45"
Strokes of work slide for stacked gears —.85 to 1"

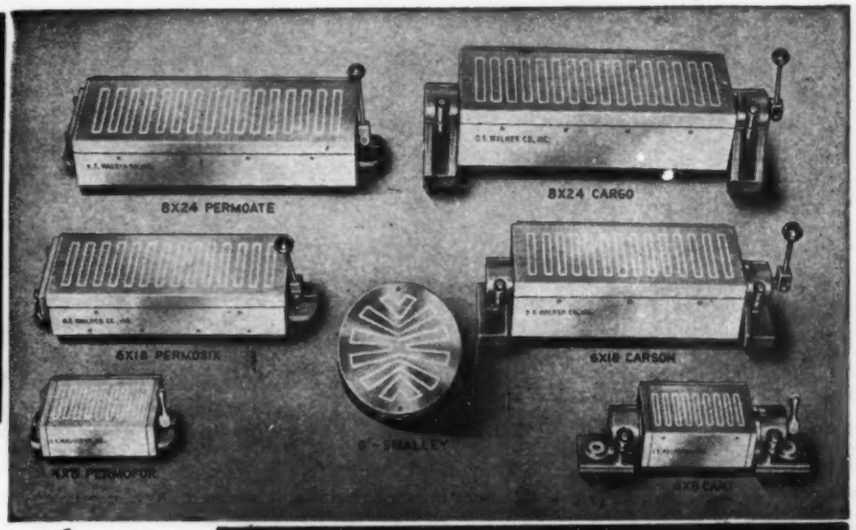
GEAR MACHINES

Pitch diameter, capacity 1½"
Strokes for work slide, .40", .65", 1.00", 1.25"

WALTHAM MACHINE WORKS
WALTHAM, MASS.

WALTHAM
TRADE MARK
REGISTERED U.S.PAT.OFF.

Walker Chucks



Truly a credit to the O. S. Walker Co., Inc.

Over 60 years of chuck building, design, and engineering experience is incorporated into these PERMOS.

WALKER ENGINEERS invite you to present your problems for solution at no obligation.

REMEMBER there is a WALKER CHUCK for every known application.

O. S. WALKER CO., INC.

Original Designers and Builders of Magnetic Chucks

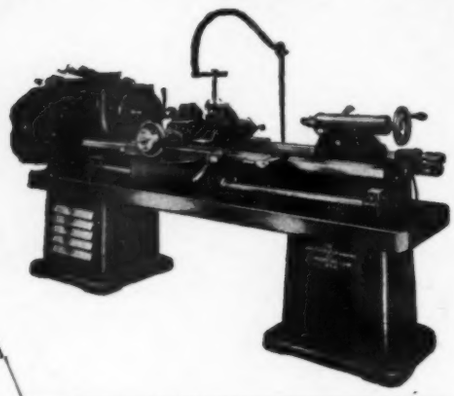
Worcester 6, Mass.

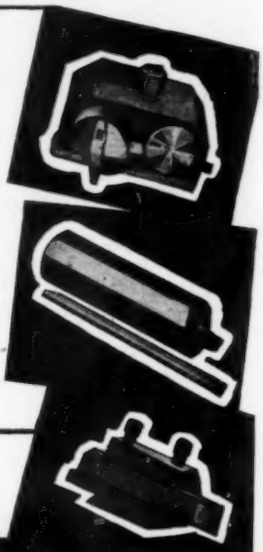
This is the
WALKER PERMANENT CHUCK FAMILY

40 YEARS OF EXPERIENCE produced
THE NEW COULTER
AUTOMATIC THREADING LATHE

The many different and number of threading tools which can be arranged on the tool slides both front and rear, make this machine the most versatile of any for production of square, standard, and 29 degree threads, both internal and external.

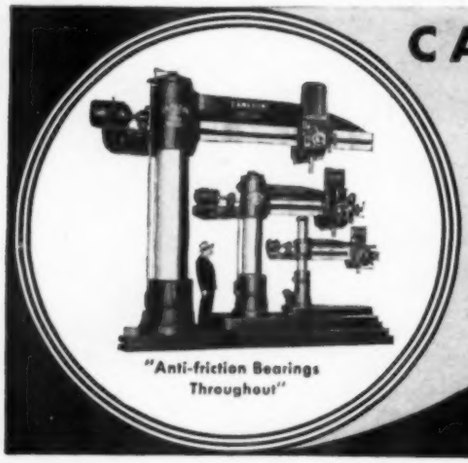
Equipped with disc clutch. . . . Easy to operate. . . . Rigid Construction. . . . Four speed headstock. . . . Return or Idle travel speed has been increased five times cutting speed.





PRODUCTION MACHINES SINCE 1896
Write for full particulars

The James COULTER *Machine Co.*
BRIDGEPORT • CONNECTICUT • U.S.A.



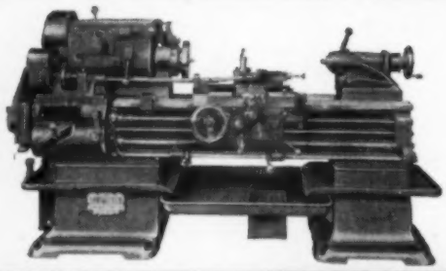
"Anti-friction Bearings Throughout"

CARLTON RADIAL DRILL

FEATURES — 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The CARLTON
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U.S.A.

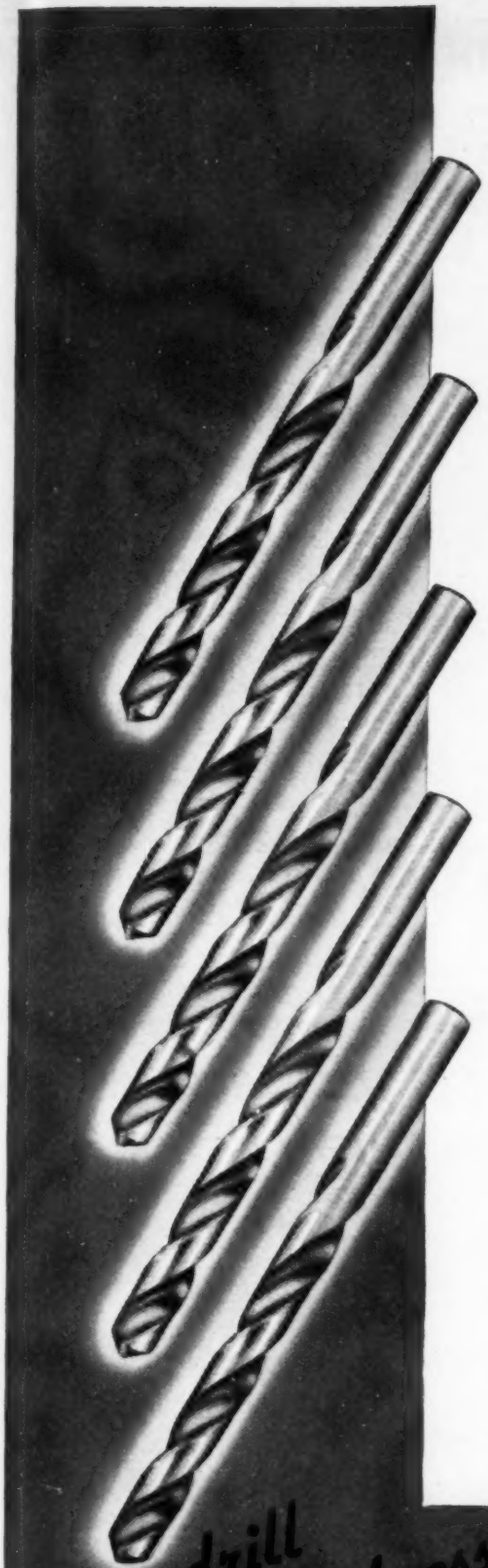
SPRINGFIELD GEARED HEAD LATHES



. . . flexible, efficient!

Springfield designs lathes to retain accuracy and speed over long periods of use. For quantity production or special use they're economical and extremely adaptable. Sizes available range from 14" to 30". *Write for descriptive bulletins, prices and deliveries.*

The SPRINGFIELD MACHINE TOOL COMPANY • • • SPRINGFIELD, OHIO, U.S.A.



DEPENDABLE DRILL PERFORMANCE

It is easy enough to put a few drills in the shop and get a favorable report on their performance. But what about the next order . . . and the next? Will *every* drill in *every* lot give you a consistently satisfactory performance? They will if they are ACE Drills.

ACE Drills have a *uniform* high quality because the flutes are ground into solid, uniformly hardened drill length bars of high speed steel. Uniform hardness is obtained by passing mill length bars through a 22 foot long hardening furnace in a continuous line . . . bar after bar.

The bars enter and leave the furnace through small flame-sealed openings which eliminate sudden rushes of air when doors are opened as they are in batch type hardening processes. Uniform furnace conditions are thus assured. The continuous feed of the bars in the ACE process exposes each part of each bar to identical treatment resulting in thoroughly uniform heat treating. Thus ACE Drill hardness is uniform to within one-half ROCKWELL point giving ACE Drill users consistently dependable drill performance.

2256

Ace drill uniform hardness reduces down-time on automatic machines

ACE DRILL CORPORATION

MANUFACTURERS OF GROUND-FROM-THE-SOLID DRILLS AND REAMERS

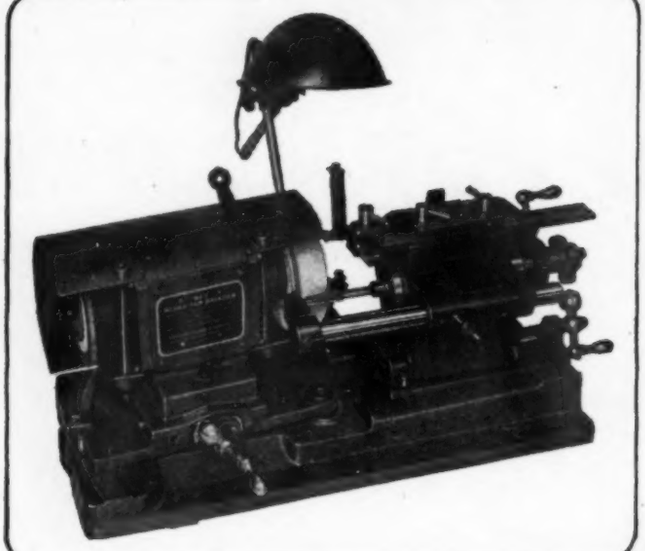
13835 JENNINGS STREET DETROIT 27, MICH.

EDWARD

Blake

COMPANY

634 COMMONWEALTH AVE., NEWTON CENTRE 59, MASS.



ACCURATE TAP SHARPENING IN *TWO EASY SIMULTANEOUS* MOTIONS

1. WHILE the right hand revolves the work crank—
2. The left hand operates the feed crank.

That's all there is to operating a BLAKE TAP GRINDER to chamfer-sharpen taps: two simple simultaneous motions that are as easy and quick to perform as the sharpening of a pencil in a pencil sharpener.

The setup of the work is just as easy. Taps may be inserted and removed *in a few seconds*, and a simple locating device insures correct positioning and duplication of the work. Both right- and left-hand taps can be sharpened *without any change* in the machine.

No extra equipment is necessary for sharpening 2, 3, 4, 5, 6, 8 or 10-flute taps. You can grind *any desired relief* and *chamfer angle*. Taps from No. 0 to ½" can be held on O.D. of thread . . . from No. 0 to ⅝", on the shank . . . and from No. 0 to 2", on centers. Also, step drills, 3- and 4-flute drills, countersinks, the lead on reamers, and many other tools requiring relief on the point can be sharpened just as easily and quickly.

Send us the coupon for full details of this bench-size, inexpensive, and profitable answer to your tap sharpening problems.

Please send me Bulletin 544 which gives complete details on Blake Tap Grinders. A.M.

NAME _____ TITLE _____

COMPANY _____

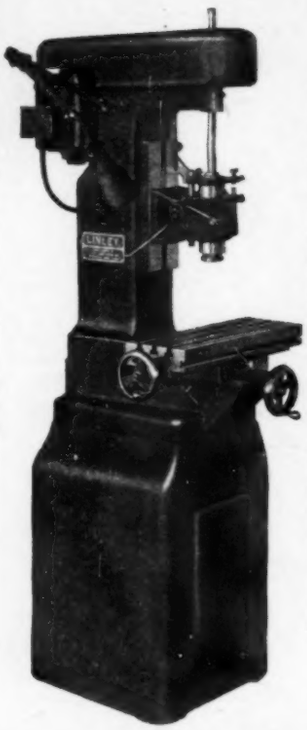
STREET _____

CITY _____ STATE _____

BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—WALTHAM CUTTER SHARPENERS

SMOOTH OPERATION ASSURED

. . . TO 4250 R.P.M.



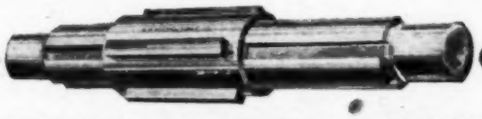
All rotating parts on the Linley Miller and Jig Borer are specially balanced to give its 8 spindle speeds the maximum efficiency for work on small dies, jigs, fixtures, patterns and models. No need to use larger machines with higher rated capacities for work the Linley can do fast, accurately and economically.

Tool room men will appreciate such factors as direct micrometer setting, anti-backlash in quill travel and velvet-smooth feed. Only 2½ sq. ft. of space needed, ample (7" x 17½") table size, and 11½" provides plenty of room from table top to spindle end.

Here's a time and money saver to investigate.

Bulletin gives details.

LINLEY BROTHERS COMPANY
664 STATE ST. EXTENSION
BRIDGEPORT 1, CONNECTICUT



NICHOLSON EXPANDING MANDRELS

Save Time 2 Ways

1) By saving the time lost in making or looking for solid arbors.
2) By promoting precision.

Set of 19 does the work of 209 solid arbors. Hardened tool steel. Two types; all sizes. Sold singly or in sets. Bulletin 1043.

Other Products: Steam Traps, Control Valves, Arbor Presses, etc.

W. H. NICHOLSON & CO., 114 Oregon St., Wilkes-Barre, Pa

ABRASIVE

ACCURACY BOOSTS PRODUCTION

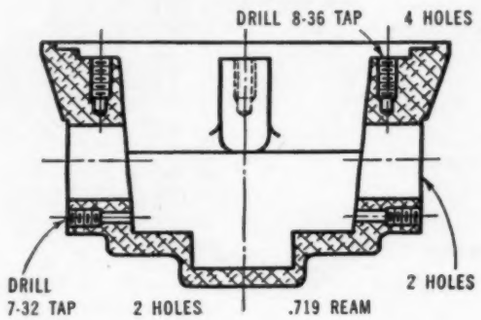
No. 1G	INTERNAL GRINDER	**No. 34**	VERTICAL SPINDLE SURFACE GRINDER
No. 1½	HAND FEED SURFACE GRINDER	**No. 3B**	AUTOMATIC FEED SURFACE GRINDER

Look for Our Full Page Advertisements

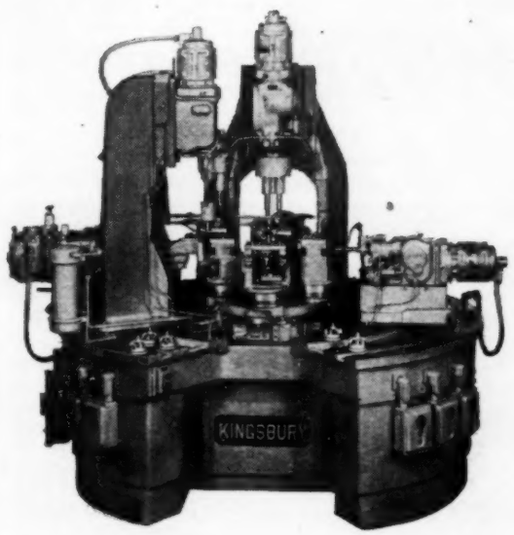
ABRASIVE MACHINE TOOL CO.
EAST PROVIDENCE 14, RHODE ISLAND

Multiple Drilling for High Production

Problem Drill, tap and ream this die cast motor end bell. Accurate location is important.

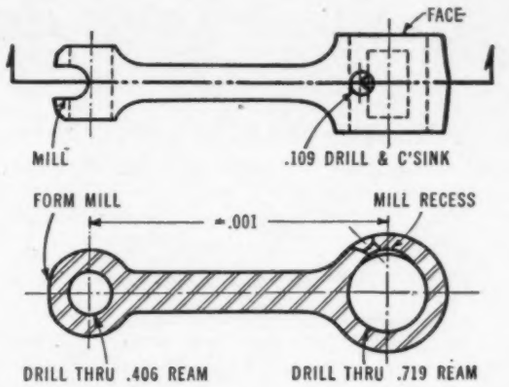


Method SPECIAL ROTATING FIXTURES make possible operations on both sides of the piece. In a single chucking, operations are performed progressively on one side at the three working stations, then the operator rotates the fixture 180° and the opposite holes are machined.

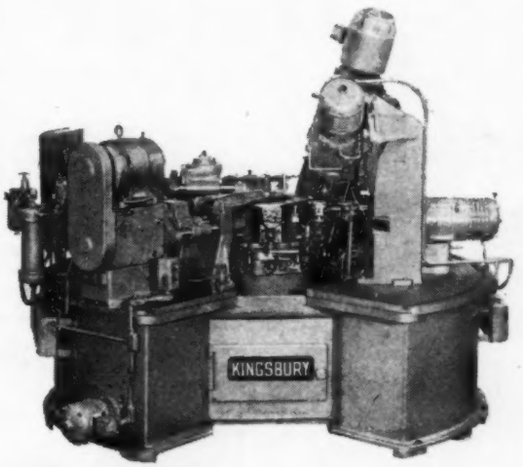


Results 220 PIECES PER HOUR GROSS and substantial savings costs. If your high production work requires multiple drilling up to an inch or so in diameter, let us propose a machine that will be completely designed and tooled ready to do your job. Send us a print and outline the operations and hourly production desired.

Problem Machine this forged steel connecting rod as shown.



Method THE HARD-TO-REACH RECESS is milled by means of a unique device that automatically tilts the head-unit upward to make a plunge cut at the proper time. The holes are accurately located because the work is not disturbed in the fixture between operations. The machine is a nine spindle "auto-index" with eight identical work fixtures.



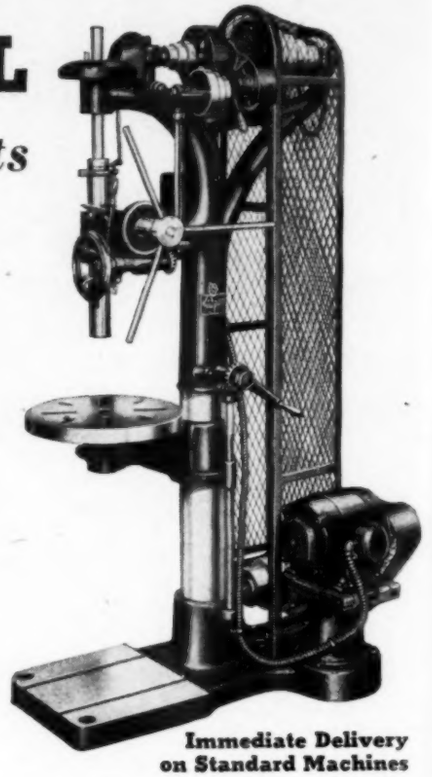
Results 150 PIECES PER HOUR GROSS. The unit cost is lower now because of more output per man hour, fewer rejections, less handling and less floor space. The initial cost is lower than most special purpose machines because the indexing, drilling and milling units and the base are all standard.

KINGSBURY MACHINE TOOL CORP., KEENE, N. H., U. S. A.

Kingsbury

A NEW 20" DRILL

To Meet Your Requirements



FOR ACCURACY Ruggedly designed for modern production. All parts tooled for interchangeability—Spindle is forged steel and quill has bronze oil-groove bushings—Morse taper as well as table arm is bored in spindle after assembly—table surface held at right angle to spindle to .007 in 6 inches.

FOR SPEED Convenient controls with long wearing designed mechanism speeds up operator handling—reduces fatigue and chance for spoilage. Table rotates on arm, and both swing on machined column for working space on base. Automatic feed trip operates through full spindle travel.

FOR CAPACITY Power is delivered smoothly to give the Sibley 20" a capacity of 1¼" in cast iron or equivalent in other metals. Drive gears of 1:2 and large back gears of 1:4 ratios deliver ample power for every load—Castings are high-tensile, semi-steel. Motor drive is cast integral with the machine base.

SIBLEY MACHINE & FOUNDRY CORP., 30 East Tutt Street, South Bend 23, Indiana

Immediate Delivery on Standard Machines

SIBLEY A REPUTABLE NAME IN DRILLING MACHINES

for Continuous

PRODUCTION

HIGH DUTY

Kaufman No. 10A Hi-Duty single spindle Lead Screw Tapper, made in 3 HP and 1½ HP models, with ¾" N.C. and 1⅛" N.C. Threads in alloy steel, offers these features:

Fully enclosed . . . lead screw and nut operate constantly in oil bath . . . positively wear-proof clutches instantly engaged and controlled by air cylinder . . . quick traverse when not actually cutting threads . . . accurate depth control . . . control to protect tap overload, and further protected against jamming if work is placed in upside down . . . class 3 fits always assured and perfectly controllable.

COMPLETE INFORMATION UPON REQUEST

KAUFMAN MFG. CO.
MANITOWOC, WISCONSIN

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

Giant KEYSEATERS

MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

Original System of Inserted Blade

OK *Milling and Boring Tools*

See Issue November 7th, 1946 American Machinist

THE OK TOOL CO.
SHELTON, CONN.

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LELAND-GIFFORD COMPANY

A card addressed to any of our offices will bring a qualified engineer right to your door.

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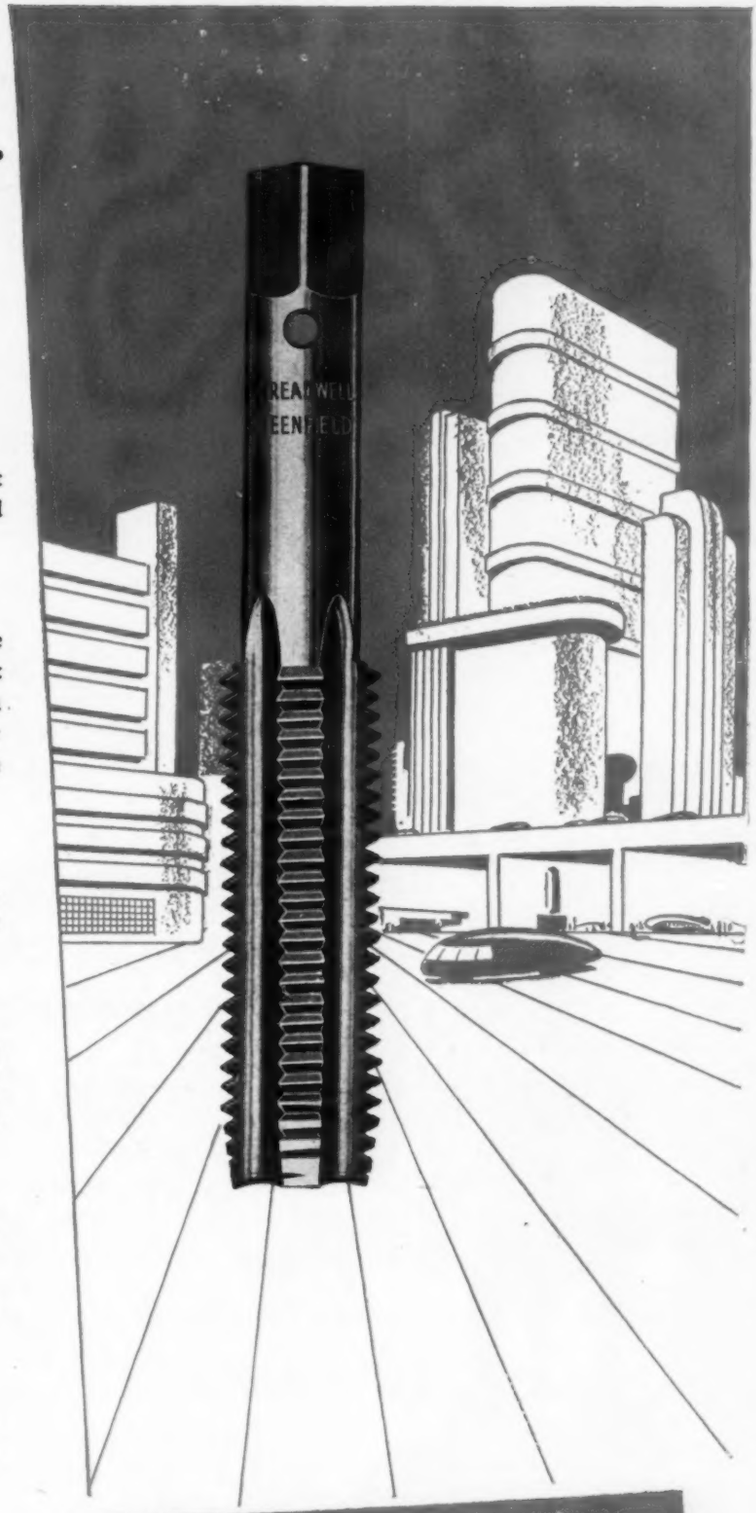
WORCESTER 1, MASSACHUSETTS, U. S. A.

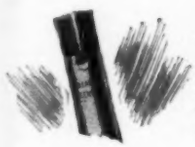
WHY NOT SPECIFY 1947 MODEL TAPS...

Threadwell TAPS



Until *Threadwell* added:

COLD TEMPER deep-freeze treatment at 120° below zero to make high speed taps stronger but less brittle



"*i-dot-ification*" — *red* dot on the shank to identify cut thread, *white* dot on commercial ground, *blue* dot on precision ground — to make it easy for you to select the right tap for the job

Greaseless Rust-Proofing to keep taps always clean, dry and shining instead of messy and sticky to handle

Tap-Capsule to keep each ground thread tap clean and sharp and permit ready selection of type and size without unwrapping

Until *Threadwell* added these performance and convenience features, there hadn't been a change in tap "model" for years.

For up-to-the-minute threading you need Threadwell 1947 Model Taps.

THEY COST NO MORE

The Threadwell distributor in your neighborhood is ready to give you the best modern service, too. May we put you in touch with him?

DISTRIBUTORS IN LEADING INDUSTRIAL CENTERS THROUGHOUT THE UNITED STATES AND THE WORLD

Threadwell

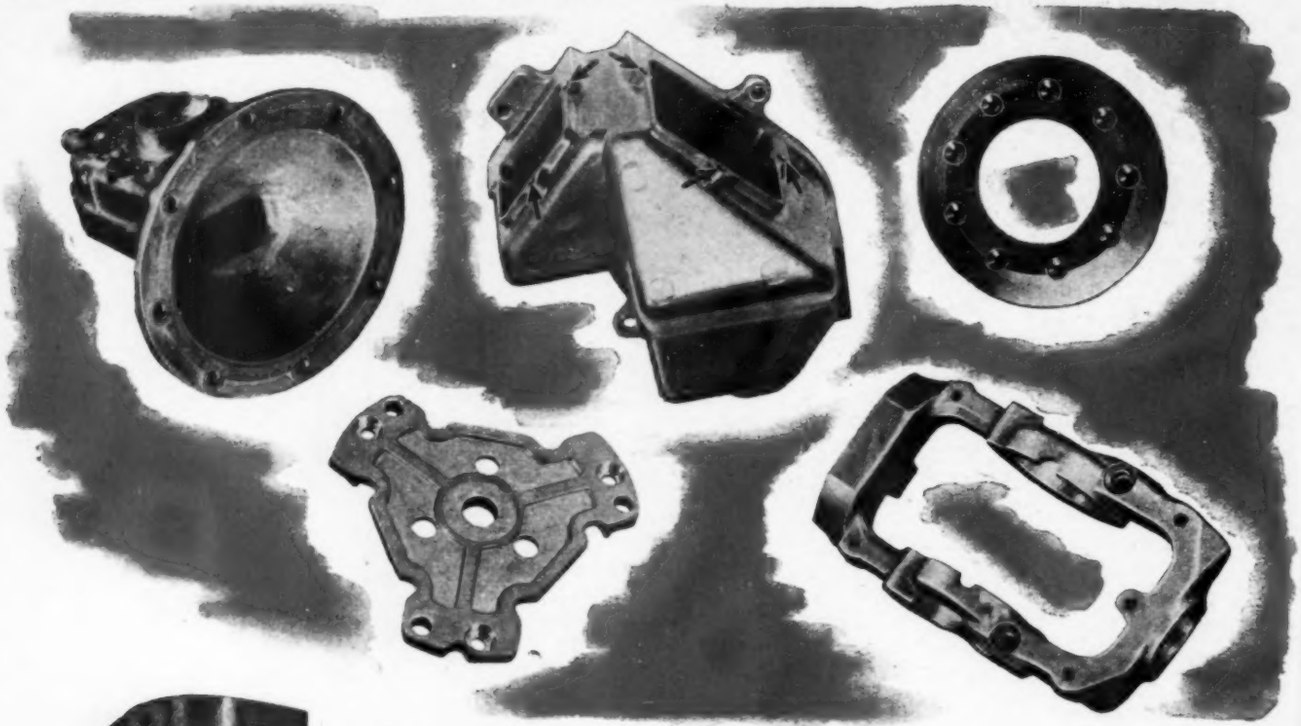
SINCE 1902

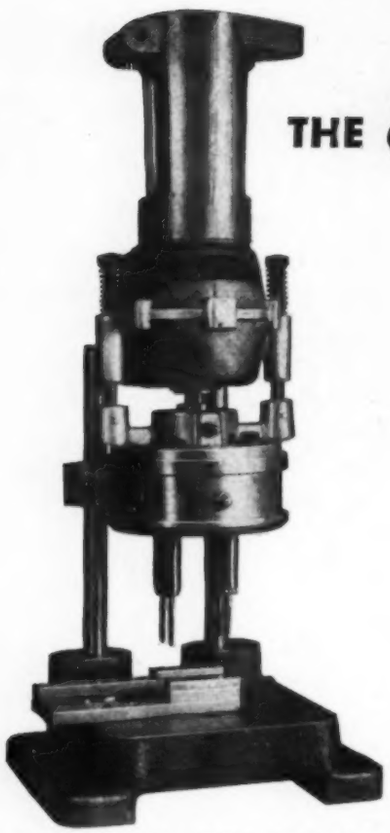
"TAPS OF DISTINCTION"

THREADWELL TAP AND DIE COMPANY • GREENFIELD, MASSACHUSETTS, U. S. A.

CALIFORNIA OFFICE, THREADWELL TAP & DIE CO. OF CALIF., 1322 SANTA FE AVE., LOS ANGELES 21

IF YOU DRILL OR TAP SMALL PARTS LIKE THESE . . .





A typical setup of a Multiple Tapping Head with a "slide-in" work holding fixture bolted to a standard bed plate. This arrangement provides automatic and accurate positioning of the part, reducing setup time to a minimum and insuring smooth, steady production.

THE *Ettco-Emrick* SYSTEM OF MULTIPLE HEADS CAN HELP YOU MAINTAIN TOP PRODUCTION AT LOW COST

That's because the Ettco-Emrick Multiple Head System provides both the *method* and the *equipment* needed to keep small parts drilling and tapping at highest production levels.

Every detail of the job is studied to make possible the fastest handling and the drilling of the maximum number of holes at every stroke of the press.

And, when an Ettco-Emrick Multiple Spindle Head is developed to carry out these methods, it is made up of standard parts so that your tooling investment can be kept to a minimum.

FOR RECOMMENDATIONS

on any particular small part, send us a sample or drawing with required production figures.

WRITE FOR BULLETIN No. 31

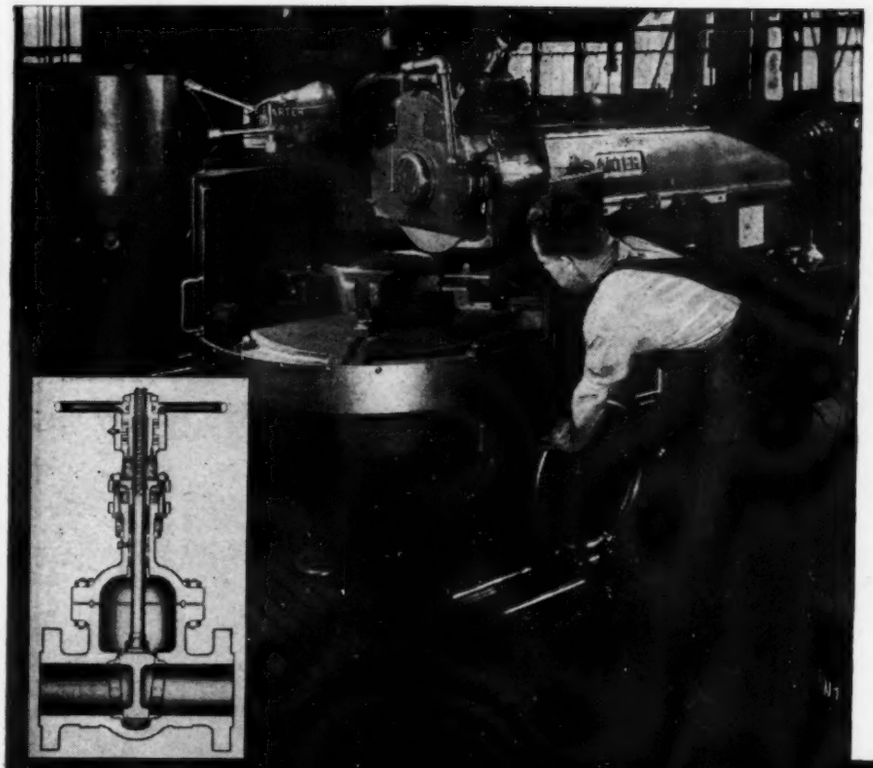
It gives the full story of the money and time saving advantages of the Ettco-Emrick System for multiple drilling and tapping of small parts.

ETTCO TOOL CO.

590 JOHNSON AVENUE, BROOKLYN 6, N. Y.

DETROIT 1 • CHICAGO 6

Over 25 years specialization in solving Industry's drilling and tapping problems



ARTER

ROTARY SURFACE GRINDERS

are employed to grind the disc used in steel gate valves, insuring accuracy needed for continuous successful operation. These discs are ground on MODEL B ROTARY SURFACE GRINDERS using 10 degree angular fixture.

Another interesting ARTER grinding job — another example of ARTER versatility.

Model B Grinders are made in capacities up to 40".

ARTER GRINDING MACHINE COMPANY
WORCESTER, MASSACHUSETTS • U. S. A.

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

Famous for

- ACCURACY OF THREADS
- LOW CHASER COST
- ALL AROUND DEPENDABILITY

Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

See our Advt. on page 296, Dec 5, '46 American Machinist

THE EASTERN MACHINE SCREW CORP., 20-40 Barclay St., New Haven, Conn.
Los Angeles: A. C. Behringer, 324 N. San Pedro St., San Francisco: Guy Reynolds, 464 Vernon St., Oakland, Canada: F. Barber Machinery Co., Toronto, Canada.

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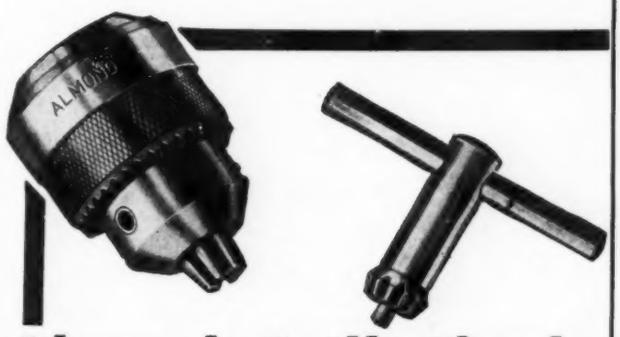


Almond Drill Chuck

THE FIRST IN THE FIELD

ALMOND THREE-JAW DRILL CHUCKS were the first to be placed on the market over Seventy years ago. As Pioneers in the field of Drill Chucks, the name "ALMOND" has long been associated with the logical procedure of machine developments. ALMOND DRILL CHUCKS are made in types and sizes to fit all machine tools and portable drills.

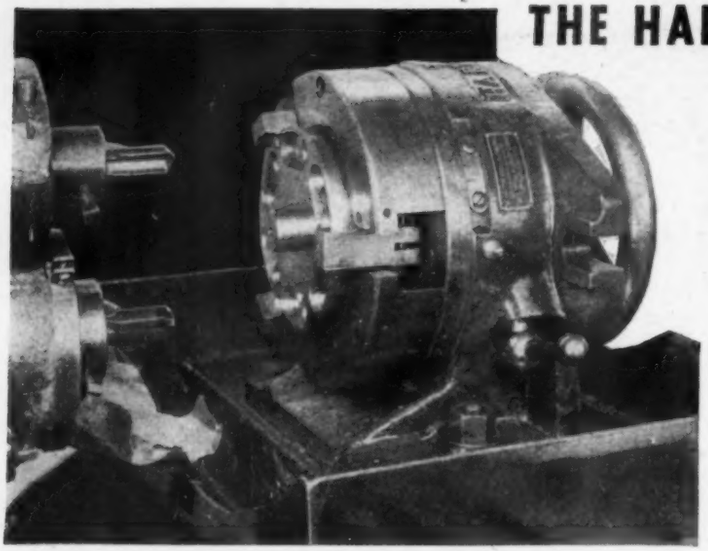
Complete information is available on request.

The Original Manufacturers of Drill Chucks

T. R. ALMOND MFG. CO.
Ashburnham, Mass., U.S.A.

THE HARTFORD SUPER-SPACER

provides accurate indexing on a finish milling job



The operation shown here involves finish milling of an aircraft engine part. The job is handled by mounting a handwheel-controlled quick-clamping fixture on the base of the Super-Spacer. Rapid, convenient and fool-proof indexing is accomplished without difficulty. Any chance of error is eliminated by the use of mask plates which are an inherent feature in the Hartford Super-Spacer.

The Hartford Super-Spacer lends itself to an almost unlimited variety of applications in the tool room and in mass production. Saving in set-up time, the ability to speed up cuts and the ease with which indexing is accomplished result in savings which assure a quick return on the investment.

Several attachments are available for use with the Hartford Super-Spacer and greatly extend its usefulness. Frequently these attachments will save the need for investing in costly jigs and fixtures. When thinking of indexing operations, therefore, think of the possibilities of the Super-Spacer.

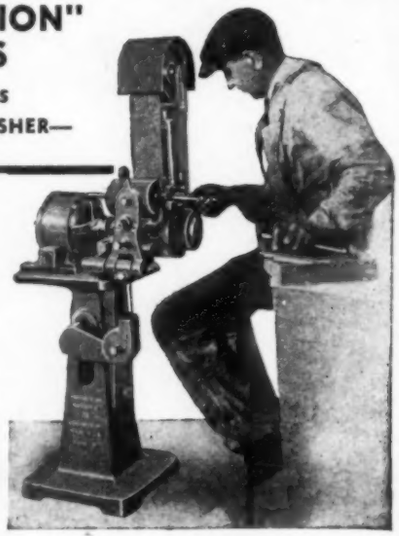
Full information is available on request.

Ask for latest Super-Spacer literature which contains many examples of applications in every day service.

THE HARTFORD SPECIAL MACHINERY COMPANY
HARTFORD 5, CONNECTICUT

"PRODUCTION" TYPE S

Centerless
SURFACER—POLISHER—BUFFER



Modern High-Speed, Convenient

Cylindrical or flat work can be put on the Type S which combines a centerless feed polishing machine with a vertical or horizontal belt grinder, polisher or buffer. It can be used for any material that can be ground or polished, such as metals, rubber, fibre, wood, plastics, etc. Will handle cylindrical work 1/4" to 1" diameter.

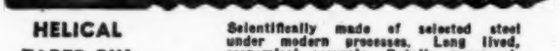
SPECIFICATIONS

Abrasive Belt—4" wide, 60" long
Motor 1 HP 1750 RPM
Belt Speed 3200' per min.
Surfacing Table to Floor (horizontal) 36"
Table 4½"x13½"
Floor Space (Vertical) 16"x24"
Floor space (Horizontal) 24"x30"

Send for illustrated literature

Production MACHINE COMPANY GREENFIELD, MASSACHUSETTS, U.S.A.

HOLMAN *BETTER, FASTER HOLE FINISHING*



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Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

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LUERS Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

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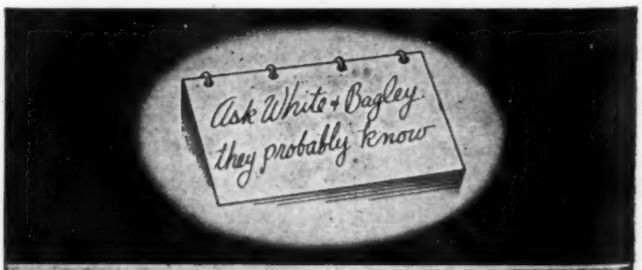

ECONOMY Grinding and Cutting Oils and Lubricants for Every Metal-Working Purpose

THE WHITE & BAGLEY COMPANY
WORCESTER, MASSACHUSETTS

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YOU CAN WORK OUT YOUR PLANT PROBLEMS IN FRACTIONS

Don't let the mere *size* of your plant needs keep you from going ahead with plans for starting a new business, or for improving or expanding your present production.

The Government offers you the opportunity to purchase or lease the facilities you may require . . . to move immediately into the business home you want—whether it be an entire plant or a mere fraction of the space.

Perhaps you may want to *expand* your production, or *modernize* your facilities, or *add* a new process, or *relocate* your business, or start a *new* enterprise. Whatever your plans, make your needs for plant and equipment known to the War Assets Administration office nearest you.

You have wide flexibility of choice from the hundreds of Government-owned surplus plants now being offered—for example: (1) Entire plants (both large and small—with or without equipment); (2) Separate buildings, where the facility is economically or operationally divisible; and (3) Leases of a *portion* of a single building under a multiple-tenancy arrangement.

Further, if you can qualify as a "small business", there is a possibility for you to purchase the plant you want under *high priority* through the Reconstruction Finance Corporation—a preference which our field offices will advise you how to obtain.

Get in touch with the nearest War Assets Administration office—see list below.

Write, phone or call for the PLANT-FINDER, a fully indexed, descriptive catalog of Government-owned plants.

WAR ASSETS ADMINISTRATION

OFFICE OF REAL PROPERTY DISPOSAL

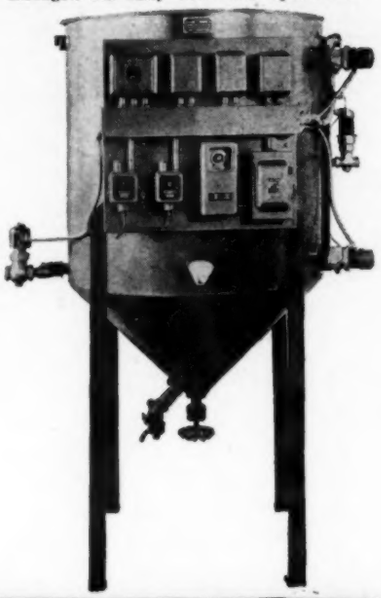
Offices located at: ATLANTA · BIRMINGHAM · BOSTON · CHARLOTTE · CHICAGO · CINCINNATI · CLEVELAND · DALLAS DENVER · DETROIT · FORT DOUGLAS, UTAH · HELENA · HOUSTON · JACKSONVILLE · KANSAS CITY, MO. · LITTLE ROCK LOS ANGELES · LOUISVILLE · MINNEAPOLIS · NASHVILLE · NEW ORLEANS · NEW YORK · OMAHA · PHILADELPHIA PORTLAND, ORE. · RICHMOND · ST. LOUIS · SAN ANTONIO · SAN FRANCISCO · SEATTLE · SPOKANE · TULSA

181-4

PREVENT CONTAMINATION – EXTEND TOOL LIFE

with the NEW BARRETT COMBINATION STERILIZER AND SEDIMENTOR for CUTTING OILS . . . .

Barrett Sterilizer and Sediment Precipitator arranged for fully automatic operation.



Protects your operators against infection—insures more and better work from your cutting tools—by sterilizing your cutting oils and precipitating sediment *at the same time.*

The NEW BARRETT STERILIZER AND PRECIPITATOR combines these two operations in one piece of apparatus which can be depended on to handle both operations effectively, efficiently and economically. Sterilization is by heat and is a positive active operation in the line ahead of the supply tank. By locating in this position, contamination is intercepted before the cutting oil is conditioned for safe, bacteria-free reuse.

Because of the heat to which the oil is subjected during sterilization, the viscosity of the cutting oil is reduced, thereby encouraging precipitation of minute heavy particles. The sediment thus liberated settles out and drops by gravity to the bottom of the sterilizer where provision is made to scrape the precipitated solids from the conical bottom and clean them out.

By thoroughly and constantly sterilizing and effectively removing solid matter, the Barrett Combination Sterilizer and Sedimentor reconditions cutting oil for reuse; sterilized for safety's sake and abrasive-free for longer tool life.

GET COMPLETE INFORMATION NOW

These units are available for floor, wall and post mounting and are furnished with semi-automatic or full automatic control as required. Send at once for detailed information on this timely Barrett development.

THE LEON J. BARRETT CO., WORCESTER, MASS.

Designers and Builders of Centrifugal Machinery

Better grinding fluid means Better Grinding

Stuart's

CODOL

LIQUID GRINDING COMPOUND

. . . The best grinding fluid you can use!

FOR FURTHER INFORMATION WRITE

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Stuart Oil Engineering Goes With Every Barrel

ANTON PARALLELS

INCREASE PRODUCTION IMPROVE QUALITY USE ANTON PARALLELS

ANTON PARALLELS FILL A LONG-FELT NEED—Permanently straight and accurate, yet priced for general machine shop use. All parallels fully guaranteed to be within the limits specified. Maximum size tolerance .001 inch on ground sides. Maximum variation in parallelism and straightness within length, .0001. Rockwell "C" hardness 65 up.

ANTON PARALLELS COME IN THREE STANDARD SIZES—

- ¼" Thick x 6" Long—½" to 1-13/16" High in Steps of 1/16" $85.00 per set—22 pairs.
- ½" Thick x 6" Long 1-3/16" to 1-13/16" High in Steps of 1/16" $71.00 per set—11 pairs. $106.00 per set of 11—3 each size.
- ¾" Thick x 6" Long—1-3/16" to 1-13/16" High in Steps of 1/16" $88.75 per set—11 pairs.

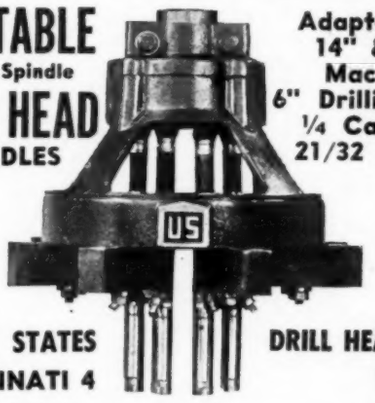
Price per set includes a handy Wooden Container. Large Stock of Single Pairs also Available. All Prices are F.O.B. New York

ANTON MACHINE WORKS

52 Sands St. Tel. TR. 5-8092 Brooklyn 1, N. Y.

DEALERS: Morris Abrams, 196 Centre St., New York 13, N. Y.; Arrow Machine Tool Co., Inc., 251 Richmond St., Providence, R. I.; Barwood Co., 3137 N. 15th St., Philadelphia, Pa.; Hansen & Hasle, 185 Myrtle Ave., Brooklyn 1, N. Y.; Toolskill Co., 55 E. Washington St., Chicago 2, Ill.

ADJUSTABLE
Multiple Spindle
DRILL HEAD
8 SPINDLES



Adaptable to 14" & 17" Machines
6" Drilling Area
¼ Capacity
21/32 Centers

UNITED STATES DRILL HEAD CO.
CINCINNATI 4 OHIO

Vitrified Wheels

VITRIFIED

. . . for

intricate precision grinding or coarse heavy work

Inasmuch as Vitrified manufactures a complete line of Grinding Wheels in numerous grades, grain combinations and bondings, it is merely a matter of selecting the right wheel for the work to be handled.

Because of this wide selection, a Vitrified Wheel can be depended on for economy, speed and long life in the specific service for which it is intended.

Whether your work involves roughing, finishing, surfacing, edging, or cleaning, hand, automatic or swing grinding, there is a Vitrified Wheel which will give you maximum service at minimum cost.

Why not call in a Vitrified representative to show you how you can make worthwhile saving in your grinding operations?

VITRIFIED WHEEL CO., WESTFIELD, MASS.

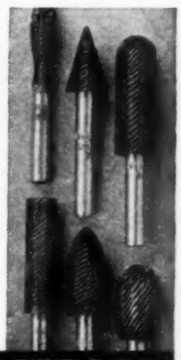
Grobet

ROTARY FILES

Hand Cut • Milled Cut Ground from the Solid

There is a GROBET ROTARY FILE in shape, size and coarseness of cut for every type of hard or soft metal, plastic, wood, etc. GROBET FILES do their jobs better and stay sharp longer.

Send for catalog DR, the most complete of its kind illustrating and describing GROBET Rotary Files, Diesinkers, Burs, Tube Burring Cutters, Chatterless, Countersink, etc.



GROBET FILE CO. of AMERICA

421 Canal Street — 1812 F. L. GROBET — **New York, 13 N. Y.**

IMPORTERS OF GROBET SWISS FILES — MFRS. OF GROBET ROTARY FILES

"BUZZER" HIGH SPEED *Gas* FURNACES

Attain High Temperatures

without BLOWER or POWER

. . . just connect to gas supply

FULL MUFFLE FURNACES . . . reach temperatures of 2400° F. without blower or power. Ideal for heat treating high speed and Alloy Steels. Also available in Bench Models.

ATMOSPHERIC POT HARDENING FURNACES . . . tangentially-fired to assure even heat up to 1650° F. are used for Salt, Cyanide and Lead Hardening. Also adapted for Melting Aluminum.

Send for the complete "BUZZER" Catalog

CHARLES A. HONES, INC.

121 So. Grand Ave. Baldwin, L. I., N. Y.

HARDNESS TESTER

The *Scleroscope* is the only hardness tester that takes in the entire range from the softest to the hardest metals without any adjustments.

MODEL D-1 DIAL TYPE

Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.

9025 VAN WYCK AVENUE
JAMAICA, NEW YORK

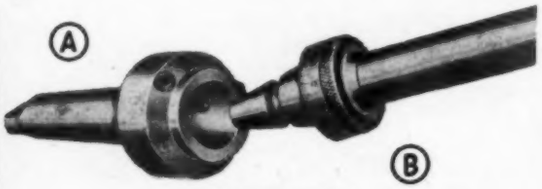
TELEPHONE: JAMAICA 6-4090

Big Saving in Set-up Time with

DIALSET

micrometric adjustment

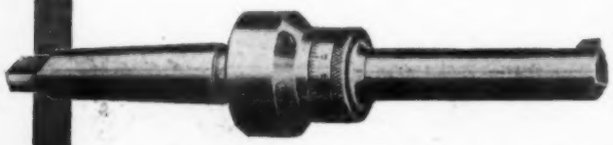
It's easy to adjust the DIALSET Boring Tool *on the job* to a half-thousandth after one trial cut. In fact, you can adjust to even closer tolerances by reading between the lines on the scale. And that saves a lot of set-up time on precision boring!



HOW IT WORKS

The socket in the adapter (A) accommodates the cone on the insert (B). Both socket and cone are eccentric. When the three setscrews are loosened, the insert can be turned to any reading desired on the dial. Each graduation indicates a change of .0005" in the boring diameter. A full adjustment of .025" can be made. Tightening the setscrews holds the insert in the adapter so firmly that the DIALSET Tool has the rigidity of a one-piece boring bar.

The DIALSET line comprises three groups of tools. The "A" series consists of an adapter and four inserts with minimum cutting diameters ranging from 3/8" to 1-1/16"; "B" series, an adapter and five inserts, 1-1/2" to 2-1/2"; "C" series, an adapter and three inserts, 3" to 4". Straight and taper shanks and standard. Special DIALSETs are made to order.



Mail the coupon or write for bulletin describing and pricing DIALSET Tools. Literature on STATE Four-Cutter Boring Bars and Velsey Black Granite Surface Plates will also be sent if you so indicate.

EAST SHORE MACHINE PRODUCTS CO.
State Tools Div., Dept. 1
835 E. 140th St., Cleveland 10, Ohio

Send complete information on DIALSET Tools; ☐ Four-Cutter Boring Bars; ☐ Velsey Black Granite Surface Plates.

Individual

Company

Street Address

City Zone State

Just ONE setting per form
Just ONE continuous motion

"Fluidmotion"* FEATURES:

.0001" accuracy • Automatic Centering • "Fluidmotion" dressing • Dustproof and shatterless • hardened stainless steel • 7" & 14" wheel capacities • Highest quality diamonds.

Prominent users tell us that they consider "Fluidmotion" Radii & Angle Dressers the finest precision dressing instruments procurable—regardless of cost. They obtain greater accuracy, longer wheel life, and much faster setup and operation.

We'll be glad to send you complete information. Write

*Reg. U. S. Pat. Off.

J & S TOOL CO. 477 Main St. East Orange 1, N. J.

Representatives in Principal Cities

Save three ways with Grand Rapids No. 10-B Combination Tap and Drill Grinder:
1. Lower first cost; 2. Less maintenance expense;
3. Valuable floor space.

Write for Bulletin 9-15-44

Grand Rapids 10-B Combination Tap and Drill Grinder

GALLMEYER & LIVINGSTON COMPANY
Manufacturers of Grand Rapids Grinders
330 STRAIGHT ST., S. W., GRAND RAPIDS 4, MICH.

ERRINGTON MECHANICAL LABORATORY

STAPLETON, STATEN ISLAND 4, N. Y.

MULTIPLE HEADS

Super-Sensitive Fixed Center Multiple Drilling Heads
Fixed-Center Auto-Reverse Multiple Tapping Heads
All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles
ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD

GO AHEAD-

we'll take care of the baby!

This old lap of ours was just made for you to drop your tooling problem in. We've been at it for years. Try us on yours, and get that machine tool trouble off your hands.

JIGS • FIXTURES • SPECIAL TOOLS
BUILDING COMPLETE MACHINE TOOLS
UNITS FOR MACHINE TOOLS
PUNCHES AND DIES

COLUMBUS DIE·TOOL and Machine Co.
940 CLEVELAND AVE.,
COLUMBUS 1 OHIO
ESTABLISHED 1906

VALVAIR WON'T LEAK AFTER *Millions* OF OPERATIONS!

Sensational performance? Perhaps; certainly thoroughly proven, thoroughly dependable; over 2,000,000 operations at 100 lbs. pressure and still going strong. Non-corrosive—cast bronze body, stainless steel parts; no metal seats to cause trouble; full pipe area utilized with minimum pressure drop. *A Valvair for every need:* 3 types, 8 designs, 5 sizes (¼" to 1").

Ask for our Bulletin AA or a Valvair representative.

VALVAIR CORPORATION • 454 Morgan Avenue, Akron 11, Ohio

Valvair
2-WAY 3-WAY 4-WAY

Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin—also circulars on Drill Grinders, Point Thinners, Tool and Cutter Grinders, Face Mill Grinders and Tool Bit Grinders.

OLIVER OF ADRIAN PRODUCTS

Oliver Instrument Co., 1414 Maumee St., Adrian, Mich.

BENEFIT

When Hiring by Consulting Your Local

SERVICE MEN'S CENTER

Available for IMMEDIATE DELIVERY

HUB POWER PRESS
With Motor Drives
for speed, accuracy and economy

These convenient, high speed, power presses will handle materials with ease and convenience. Assures high production of parts at lowest cost.

Made in 4½, 6 and 15 Ton Capacities.

Send for Circulars and Prices.

WILLIAM F. BREWER MACHINE CO.
75 LAUREL STREET **HARTFORD 6, CONN.**

How to Keep Wheels Clean & Free-Cutting With Oakite Soluble Oil

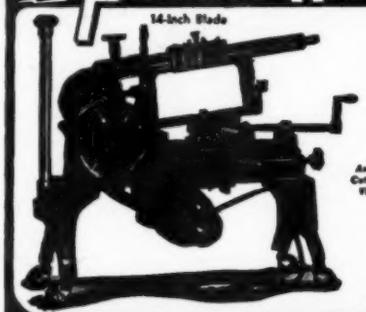
HERE'S the information you've wanted! It's an Oakite Booklet that explains how coolants (for all your machining operations) made up with Oakite Soluble Oil provide maximum cooling . . . precise lubrication. Shows how Oakite coolants minimize your loading and glazing problems; how wheels stay clean and free-cutting—need less dressing. Tells how use of Oakite Soluble Oil based coolants help you get precision finishes. Gives directions for use of Oakite coolants.

THIS TWENTY-PAGE OAKITE MANUAL—YOURS FOR THE ASKING. Write Oakite Products, Inc., 24 Thames Street, New York 6, N. Y.

OAKITE
REG. U. S. PAT. OFF.
SPECIALIZED CLEANING MATERIALS • METHODS • SERVICE
Technical Representatives in Principal Cities of U. S. & Canada

CRAFTS DIAMOND TOOLS
Consistent Quality

POWER HACK SAW



LOW PRICED
SELF-CONTAINED
PORTABLE
STURDY
READY TO WORK
ECONOMICAL
EXPORT DEPT.
1111 SO. FERRY BLD'G.
NEW YORK 4, N.Y.
WRITE FOR BULLETIN NO. 400

MILLER-KNUTH MFG. CO. OMAHA, NEB.

SEARCHLIGHT SECTION

AT AUCTION

PRESSES, SHEARS, TOOLS MACHINERY and EQUIPMENT of

JOHN DUNLAP COMPANY

Makers of Reflectors, Electric Fixtures, Enamelware

CARNEGIE (Pittsburgh), Pa.

TUESDAY, JANUARY 21, 1947, AT 10 A. M.

On the Premises

24 PRESSES, including Garrison Dunlap 500 Ton toggle drawing and arch presses, Toledo blanking and forming press, Bliss toggle drawing presses, Ferracute drawing and inclinable presses, Bliss and Toledo horning presses, etc.

MACHINE TOOLS: Back geared and quick change back geared engine lathes and turret and tool room lathes by American, LeBlond, Hanley, New Haven, Reed, Bardons & Oliver and Jones & Lamson. Shapers, grinders, horizontal and vertical milling machines, planer, hack saw, drill presses.

Lot cast iron and steel electric fixture and cooking utensil dies; squaring, rotary circle and slitting shears by Ohls, Niagara and Bliss. Bliss, Dunlap and Morgan Williams spinning lathes; forming rolls, trimmers and welders.

Enameling and heat treating furnaces, pebble and test mills, rumbling and tumbling barrels, motor generator sets, electric motors from 1 to 20 H. P., portable grinders and drills, factory trucks, fans, blowers, scales, tanks, small tools, vises, office furniture and equipment, Chevrolet truck, etc.

36,000 lbs. 26-gauge cold rolled steel sheets, quantity black sheet steel, stock of electric reflectors, electric supplies, stock of enamelware, etc.

Descriptive Catalog Upon Application to

SAMUEL T. FREEMAN & CO., *Auctioneers*

1808-10 Chestnut St., Philadelphia 3

27 William Street, New York 5 **80 Federal Street, Boston 10**

Additional Auction Advertisement on opposite page

SEARCHLIGHT SECTION

CONTRACT WORK

WANTED PRODUCT OF CONTRACT WORK

Machinery manufacturing concern with extensive experience desires a product to manufacture on a contract basis or straight contract work.
Manufacturer has modern well equipped machine shop, capable of making small, medium or large machinery, tools, jigs, fixtures, gages, stamping dies, stampings, electronic assemblies, gear drives and small parts of all types. Excellent engineering facilities and good contacts for all types of foundry work are available.

Send for our bulletin #10A

C. W. JARVI MFG. COMPANY, INC.
NORTH ATTLEBORO MASSACHUSETTS

PURCHASING AGENTS!

Farnham machines do the job! Aircraft war work gave us valuable experience in fabricating light metals, enabled us to design new machines for this work. Call on FARNHAM with your problem in special machinery.

FARNHAM
MANUFACTURING COMPANY
1646 SENECA ST. • BUFFALO 10, N. Y.

SEND B.P. FOR MFG. COMPLETE ASSEMBLIES

Tool—Jigs—Dies
Screw Machine and Turret Lathe Work
Stampings—Gears

POSSY'S TOOL & MFG. CO.
51 Meadowbrook Buffalo 6, N. Y.

HOBBING PRESSES

Self contained units for prompt delivery 11" Left to right 18" Front to back for Hobbing mold cavities die sinking Etc.

M&N MACHINE TOOL WKS.
149 Orono St. Clifton, N. J.

La Salle Engineering Co.
TOOLS, PRODUCTS, SPECIAL MACHINES; DESIGN & BUILD
CHICAGO
LOS ANGELES
NEW YORK

Screw Machines and Eyelet Machines

We have open capacity for assembly work. Screw Machine capacity up to 2½". Eyelet Machines up to ⅜" capacity. Small size presses available.

Prices Quoted Immediately on Request

THE BLAZYS MACHINE CO.
MIDDLEBURY ROAD WATERTOWN, CONN.

PATTERNS in WOOD and METAL

For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them.

GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

POSITIONS VACANT

(Additional Position Vacant ad on page 202)

CONTACT MAN Wanted by medium sized Tool & Die shop in Detroit, Michigan, for New York, New Jersey and Connecticut area, for Jigs, Fixtures, Multiple Spindle Drill Heads and Special Machinery. Must have very good sources —commission basis. P-827, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

WANTED: Experienced Design Engineer to design precision machines and equipment for rebuilding internal combustion engines, principally automotive. Excellent opportunity promising permanency and advancement offered by progressive, old-line company in middle-west. Write Today giving complete personnel history, enclosing recent photograph or snapshot. All information confidential. P-838, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

EMPLOYMENT SERVICE

SALARIED POSITIONS $2,500-$25,000. This thoroughly organized confidential service of thirty-seven years' recognized standing and reputation carries on preliminary negotiations for supervisory technical and executive positions of the calibre indicated through a procedure individualized to each client's requirements. Retaining fee protected by refund provision. Identity covered and present position protected. Send only name and address for details. R. W. Bixby, Inc. 266 Dunn Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

PRODUCTION ADMINISTRATIVE Executive: 25 years of unusual and successful "Management" background. Thoroughly experienced in all phases of "Plant" and "Administrative" procedures, controls and methods. Positions held in capacity of Works Manager and Chief Industrial Management Executive. New York vicinity preferred. PW-810, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PRODUCTION ENGINEER—25 years of cost cutting, in production, Tooling and industrial, engineering, varied metal lines,—Broad, successful background in plant and administration, now employed, Medium size firm. PW-840, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

SUPERVISOR of Tools and Factory supplies—50—with over 20 years experience in this position with one of the largest gasoline motor building concerns, building approximately 164 different model motors. Have knowledge of all standard and special tools, and miscellaneous items for building motors. Full knowledge of grinding wheels and tool salvage. References. PW-841, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

EXPORT MANAGER—Machine Tools etc. Unusually qualified. PW-842, American Machinist, 330 W. 42nd St., New York 18, N. Y.

(Continued on page 202)

WANTED SALES ENGINEER

To act as Manufacturer's Agent for leading, well rated, Mid-west precision gear manufacturer. New selling policy makes available open territories in most sections of the country. Prefer representation by men who have a knowledge of gears and also have a wide acquaintance with top buyers.

We are not a jobbing house and handle large quantity orders only. Earnings on straight commissions are potentially very high. No objection to non-conflicting other lines. To receive attention, your reply should give complete details regarding the qualifications of yourself or your organization.

RW-831, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

Chief Mechanical Engineer Wanted

Medium sized plant in Eastern Pennsylvania requires man to supervise engineering, tool design, machining, and assembly methods. Light to medium type machinery manufacturer. High grade man with extensive experience required.

P-833, AMERICAN MACHINIST
330 West 42nd Street, New York 18, N. Y.

WANTED EXPERIENCED ENGINEER DESIGNER

for mechanical and electrical work on movable bridges. Location Pennsylvania.

P-836, AMERICAN MACHINIST
330 West 42nd St., New York 18, N. Y.

PROFESSIONAL SERVICES

DESIGN & DEVELOPMENT SERVICE

Designers—Engineers—Builders
Automatic & Packaging Machinery
61 S. Lexington Ave., White Plains, N. Y.

LIQUIDATION SALE AT AUCTION

Machine Tools and Equipment of

ST. CLAIR MACHINE PRODUCTS CO.

10642 ST. CLAIR AVE., CLEVELAND, AHIO

TUESDAY, JANUARY 14, 1947

at 10 A.M. on the premises

Smith & Mills 25" Shapers, Monarch 20"x9'6" Quick Change Back Geared Engine Lathe, Kempsmith No. 3 Universal Horizontal Milling Machine, Thompson Cylindrical Grinder, Hill Clarke 10"x36" Cylindrical Grinder, Do-All No. 26 Band Saw and Filing Machine, 2 Milwaukee 3B Horizontal Plain Milling Machines, 2 Bardons & Oliver No. 7 Ram Type Turret Lathes, Lathes, Milling Machines, Drill Presses, Centerless, Universal and Tool Grinders, Precision Tools, New and Used Small Tools, Etc.

Descriptive Catalog Upon Application to

SAMUEL T. FREEMAN & CO., *Auctioneers*

1808-10 CHESTNUT STREET, PHILADELPHIA 3, PA.

27 William St., New York 3, N. Y. **80 Federal St., Boston 10, Mass.**

Additional Auction Ad on opposite page

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

POSITIONS WANTED
(Continued from page 201)

DESIGN ENGINEER with over 20 years experience in Machine Tool, Special Machine and Fixture Design. Capable of taking charge. Available January. PW-839, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SELLING OPPORTUNITY WANTED

ESTABLISHED IMPORT & export firm located in Shanghai, China desires additional connection with leading manufacturers. References furnished. Address: Ray Snyder c/o Dean Company, 26 O'Farrell Street, San Francisco 8, California.

PATENT ATTORNEY

PATENT and Trade-Mark Practice before U. S. Patent Office. Validity and Infringement Investigations and Opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine & Rommel, Registered Patent Attorneys, Suite 453, 815-15th Street, N. W., Washington 5, D. C.

SALES ENGINEER Lieutenant Commander U. S. Navy just released to inactive duty. Age 40 M. E. Degree, three years industrial sales experience: 16 years machine tool & plant maintenance. Wishes manufacturers representation machinery and allied lines commission basis: calling on industrial plants throughout New York, Connecticut, New Jersey and Pennsylvania.

RA-842, AMERICAN MACHINIST
330 West 42nd St., New York 18, N. Y.

Manufacturing Facilities in

ENGLAND

An old-established firm of specialists in light and medium precision engineering, controlling a group of subsidiary companies with resources ranging from modern foundries to fully equipped workshops, toolrooms and drawing offices, invite offers to manufacture American machinery under license in Great Britain.

Products for Laundry, Brewing, Bottling and Wrapping, Sugar Refining, Packing or Bakery Mixing would be particularly welcomed

Apply in first instance to

H.C.W.
SAWARD, BAKER AND COMPANY LIMITED
Incorporated Practitioners in Advertising,
27 Chancery Lane, London, W.C.2.
ENGLAND.

MANUFACTURING BUSINESS FOR SALE

We have decided to sell a department of our business due to lack of floor space. The product has been on the market for over 20 years, is made from iron and steel, and has a very wide distribution through mill supply and hardware jobbers. Requires from 10,000 to 12,000 feet of floor space. Substantial backlog of orders on hand. Approximately $160,000 required.

BO-832, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

MECHANICAL ENGINEER

● Graduate engineer for work in the mechanical development department of large plastics manufacturer. Work is interesting and diversified involving the design and development of mechanical apparatus ranging from precision laboratory testing equipment to very large production machinery. Applicants should have 4 to 8 years' experience in the design of heavy machinery of the plastic and rubber manufacturing type or of high class machine tools.

● Company is large and stable, position is permanent and offers excellent opportunities for the increased earnings as ability is demonstrated. Location is 30 miles from New York City.

● Write to our personnel department in detail stating education, marital status, experience, and salary expected.

BAKELITE CORPORATION

BOUND BROOK, NEW JERSEY

MODELS

Plant layout models made to specifications. Prototypes of any machine available in wood.

HOOSICK MODEL COMPANY
Petersburg **New York**

PETITT BROS. MACHINERY CO.

If You Want to Buy, Sell, or Trade
One Machine or Entire Plant
Consult Us Immediately
FRED PETITT — ALBERT PETITT
OFFICE AND WAREHOUSE
1240 WEST 4th ST. CHERRY 0609
CLEVELAND 13, OHIO

Equipment Wanted—page 212

EVERY ITEM GUARANTEED AS REPRESENTED

FALK FOR DEPENDABILITY IN REBUILT MACHINERY

AUTOMATICS

2—#00 Brown & Sharpe Full Automatic, Standard Speed

1—1¼" Cone 4-spindle Automatic, Motor Driven, Threading Spindle.

1—#515 National Acme 9/16" 4-spindle Automatics, complete

LATHES

Logan Q.C.G. Lathes (new).
Sebastian Engine Lathes (new).
1—LeBlond Heavy Pattern 24" x 12' 3-step cone Engine Lathe
13" x 6' Williard, geared head
14" x 6' Hendey Yoke Head
14" x 6' Rockford Cone drive (two)
14" x 20' Hendey Toolmakers Lathe.
16" x 6' American Motor Driven Lathe.
16" x 8' Lodge & Shipley 12-speed Grd. Hd.
18" x 6' Chard, M.D.
18" x 10' American, Geared Head, Taper.
18" x 222" Hendey, M.D. (two)
20" x 10' Hendey with Taper.
20" x 11' Schumacher-Boye, M.D.
24" x 24" American Lathe, motor dr.
28" x 10' Davis cone driven
48" x 30' Simmons Geared Head, 1941.

TURRET LATHES

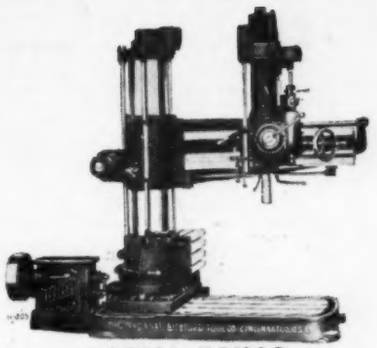
4—#4 Warner & Swasey Hand Screw Machines, arr. Motor Drive.
2—#4 Warner & Swasey Universal Turret Lathe, Motor Driven.
16" Warner & Swasey Brass Lathe.
#2A Warner & Swasey Universal.
#3R Gisholt Universal like new.
#4 Foster GFH Hand Turret Lathe.
3—Morey #2G Geared Head Turret Lathe, motor drive (late model)
2—Simmons #2 (microspeed) Turret Screw Machine (late model)
Bullard 42" Vertical Turret Lathe

TURRET PUNCHES

Hecker, vertical type, 8-station, air operated, 18" throat.

PLANERS

20" x 20" x 24" N.B.P., Planer Shaper.
26" x 26" x 8' Gray Planer, 2 heads.



RADIAL DRILLS

4' Arm, 11" Column Cincinnati-Bickford.
5' Arm, 13" Column Cincinnati-Bickford.
5' Arm, 14" Column Fosdick, motor drive.
6' Arm, 15" Column Cincinnati-Bickford.
3½', 10" Col., Cincinnati-Bickford AC Motor Drive, Gear Box.
1—Leland-Gifford 6-spdle. Drill Press (late model) ind. spdle. motors.
Cincinnati-Bickford 5' Arm, 13" round column with air clamp. Oil grooved, tee slotted base, side base, with plain box table with #5 Morse Taper spindle. Motor drive.

FOUNDRY MOULDING MACHINES

2—#0 Johnston & Jennings, Jolt Squeezer Draw Pattern, serials #58382197, #2196.
2—#42 Osborn Rockover and Draw Machines, 14" x 20½" table
3—#342 Osborn Jolt Rollover Pattern Draw Moulding Machines
2—Spo Hand Rollover Power Draw Moulding Machines complete with with run-out cars.

SHEARS & METAL WORKING

Lenoox Splitting Shear ¾" cap.; 8' throat.
Lennox Bevel Shear, ¾" cap.
Peckstow 30" x 18 ga. Squaring Shear.
Gould & Eberhardt Slitting Shear, 10 ga.
Niagara 48" Roller Leveller, 6 Rolls.

MILLING MACHINES

#3, #4, #5 Cinn. High Power, Plain, S.P.D.
#1-#1½ Brown & Sharpe Plain Miller.
P & W 2½" Duplex Spline Miller.
Thread Miller, Hall Planetary #1—24".
#8 Lees Bradner Thread Miller.
#1, #2 Kempsmith Plain Millers.
#3B Hendey Universal Miller, motor drive.
#4 Cinn. Vertical High Power Miller. (2).

MISCELLANEOUS

15 KVA Ace Spot Welder, 18" throat, 1/60/440 volt.

GRINDERS

Queen City Dble. End Grinders, motor driven (new).
#33 Abrasive Vertical Surface.
#3 Abrasive Horizontal Surface.
12" No. 22 Heald Rotary Surface Grinder.
16" Persons-Arter Rotary Surface Grinder.
1—Gardner Dble. Opposed Grinder #14
1—Seybold 96" Knife Grinder
Oliver of Adrian Drill Grinders
Cincinnati Centerless Grinders #2 M.D.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump. 15" swing, 5" hole; 4" deep.
#2 Brown & Sharpe Surface Grinder.
#70 Heald Internal Grinder.
#60 Heald Cylinder Grinder.
10" x 18" Norton Cylindrical.
2—Cincinnati, #1½ Tool & Cutter Grinders.

BORING MILLS

3½" Bar Landis-Rochester Horizontal Boring Mill, Model #36.
#31 Lucas Horizontal Boring Mill, 3" bar.

DRILLING MACHINES

Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle, #2 M. T.
Fosdick 13" Super speed 4-spindle drills.
Natco #12, 12 spindle #1 M. T.
2—Natco #14, 22 spindle Rectangular head Drilling Machine, #2 M. T.

POWER PRESS HEADQUARTERS

Famco Arbor & Foot Presses (new).
#4 Bliss D. C. Forging Press.
200 ton A.C.F. Hydraulic Press. Bed. 24" x 36", 4-post.
75 ton H.P.M. 2 post, Hydraulic Press.
Hilles & Jones #4 Single End Punch and Shear. Equipped as Plate Shear with 18" Blades. ARR, motor drive, 54" throat.

SHAPERS & GEAR CUTTERS

1—Whipp 16" B. G. Crank Shaper.
1—Fellows #6—36" Gear Shaper.
Barber-Colman Gear Hobbers #2, #3.
1—Brown & Sharpe #3—26" Automatic Gear Cutter.
#1 Adams Gear Hobbers, Belt driven (2).
24" American Direct Motor Drive.
Slotter 12" stroke New Haven, motor drive.

2—#16 Blanchard Surface Grinder, 30" dia., magnetic chuck, 25 h.p. motor on spindle.
2—#2 Cincinnati Centerless Grinder.
Pratt & Whitney Vertical Surface Grinder, 14" x 36" with 10" x 36" Magnetic Chuck. Ball Bearing Spindle. Perfect Condition.
#2 Cincinnati Universal Tool and Cutter.

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12′ x ⅝″ Bertsch Combination Punch and Shear, with 18″ gap, double geared, motor driven.

AUTOMATICS
5¼″ Cleveland Model A, single spindle.
16″ x 33″ Fay Automatic Lathe.
⅞″ Cleveland Model M, four spindle.

BORING MILL
No. 31 Lucas, motor driven.

DRILLS
★ **4 Ft. American Hole Wizard Radial Drill, motor on arm, new in 1940.**
No. D2 Colburn, single spindle.
No. 314 Baker, single spindle.
42″ Cincinnati Bickford.
Allen Sensitive Drill, four spindle.
★ **No. 3 Bausch Multiple, 20 Spindle, No. 2 Morse Taper, Rectang. Head 20″ x 40″.**
Pratt & Whitney Gun Barrel Drill.
LeBlond Gun Barrel Drill.

GEAR CUTTERS
Model A and D Barber-Colman Gear Hobbers.
No. 3 and No. 12 Barber-Coleman Gear Hobbers.
No. 61 Fellows Gear Shaper, m.d.
6″ Gleason Str. Bevel Gear Generator.

GRINDERS
36″ x 168″ Mattison Surface Grinder.
No. 22 Heald Rotary Surface Grinder.
No. 16-26″ Blanchard Surface Grinder.
No. 72A3 Heald Sizematic Int. Grinder.
No. 72A3 Heald Gagematic Int. Grinder.
No. 13 Brown & Sharpe Universal & Tool.
10″ x 24″ Norton Cylindrical Grinder.
10″ x 72″ Norton Cylindrical Grinder.
10″ x 24″ Thompson Hyd. Surface Grind.
No. 2 & No. 3 Cinci. Centerless Grinder.
No. 35 Excello Thd. Grndr., new in 1943.
No. 5VRO Hammond Buffer.

LATHES, ENGINE
14″ x 6′ Sebastian, motor in base.
16″x6′ Hendey, g.h.
20″ x 12′ Lodge & Shipley, g.h.
48″ x 12′ Lodge & Shipley, C.D.
No. 12 Gisholt Hyd. Lathe.
LR Lo-Swing Lathe, m.d., new in 1940.
15″ x 30″ Lipe Carbo-matic, new in 1943.

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No. 3A Warner & Swasey, g.h.
No. 2A Warner & Swasey, Timken Bearing, new 1942.
No. 1A Warner & Swasey, g.h., new 1943.
No. 1B Foster, g.h.
No. 4 Warner & Swasey, g.h., new in 1942.
No. 3 Warner & Swasey, g.h., new in 1943.
No. 1 Bardons & Oliver, c.d.
No. 1 Brown & Sharpe, m.d.
No. 6D Potter & Johnston Automatic Chucking and Turning Machine.

MILLS
No. 31 Lucas Horizontal Bor'g Mill, m.d.
No. 36 VanNorman, Ram Type, m.d.
No. 4A Brown & Sharpe Universal, s.p.d.
No. 3 Cincinnati Universal, s.p.d.
No. 4 Cin. Plain, Rect. Overarm.
No. 2H Milwaukee Plain double overarm, motor in base.
No. 2-MH Cincinnati Plain, m.d.
★ **No. 4H Milwaukee, Double Overarm, motor in base, new 1940.**
No. 2H Milwaukee Vert., motor in base.
No. 2209 Milwaukee, Table 22″ x 158″.
No. 3-36 Cinci. Hydromatic Duplex, m.d.
No. 6 Whitney Hand Mill.

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No. 17 Greenerd Arbor Press.
No. 100 Micromatic Hydrohoner.
8″ x 7″ Troy Vertical Steam Engine.

PLANERS AND SHAPERS
16″ Gould & Eberhardt Crank Shaper, m.d.
24″ Gould & Eberhardt Crank Shaper, s.p.d.
★ **6″ Pratt & Whitney Vertical Shaper.**
36″ x 36″ x 12′ Liberty Planer, 2 heads, box table.
42″ x 42″ x 20′ Cin. Planer, D.C. Rev. m.d.

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American 47′4″ Span
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American 77′ Span
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P & H 30′ Span
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Emsco 75′ Span
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Cleveland 65′ Span
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Tysaman 60′ Span
P & H 79′ Span
Morgan 52′3″ Span
Cleveland 106′ Span
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Bedford 56′ Span
30-TON—Whiting 80′ Span
P & H 86′ Span
P & H 60′ Span
Morgan 30′ Span
Case 41′ Span
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Northern 22′ Span
50-TON—Shaw 95′ Span
Shaw 69′10″ Span
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NILES BEMENT POND 5½" bar—M.D.
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BULLARD 24", 36", 42" New Era Type, M.D.
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KING 30" Vert., M.D.
KING 62" 2 swivel heads, PRT, AC, M.D.
NILES 42"—2 swivel heads; power rapid traverse
NILES 73", 100", 2 swivel heads, PRT, AC, M.D.

DRILLS

BAKER #121 Single spindle—latest type
BARNES #H3, Hydram, latest type
BARNES #210—single spindle—latest
BODINE 42-20, 42-30 automatics—M.D.
COLBURN #14, 2 spindle, heavy duty, AC, M.D.
EDLUND #1B, #2B, #2MS, M.D.
FOOTE BURT SIPP #2, #3—single spindle—latest
HENRY & WRIGHT 2 spindle
PRATT & WHITNEY No. ½Bx50" 2 spindle. Deep Hole—latest type

DRILLS—Radial

AMERICAN 3½'9"—Maxi-Speed, Motor Drive
AMERICAN 4'9"—4'11"—5'11"—5'13" A.C., M.D.
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CANEDY OTTO 3'11" New
CARLTON 3'11"—Latest Type
CARLTON 6'17", latest type
CARLTON 4'13" 5'14", 6'15"—M.D.
CINCINNATI BICKFORD 4'11", 4'13", 6'15", 6'19", latest type
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FOSDICK 5'14", AC, M.D.
MUELLER 4½'9", AC, M.D.
NILES BEMENT POND 6'15" uni., AC, M.D.
RYERSON 4'11", AC, M.D.
WESTERN 3', 4'18", 5'18", 6'20", latest type

GEAR CUTTING EQUIPMENT

BARBER COLMAN Type A Hobber—latest
BARBER COLMAN type S, #3, #12 Hobber, M.D.
BROWN & SHARPE #3H gear cutter, M.D.
FELLOWS #7, #7A type, all models, latest
FELLOWS #6, #6A type, all models, latest
GLEASON—12" bevel gear generator—latest
GLEASON #13 tester, M.D.
GLEASON 15" Quenching Press
GLEASON 24" Bevel Gear Planer
GLEASON 18" bevel gear generator
G & E #96H Gear Hobber, with differential
GOULD & EBERHARDT #18H Hobber—M.D.
PRATT & WHITNEY 10" Grinder, hyd. latest type

GRINDERS—Cyl.—Plain & Uni.

BROWN & SHARPE #1, #2, #3, #4 Univ., motor drive—latest type
BROWN & SHARPE #5 plain, 3x12, latest type
LANDIS 6x18, 6x20, plain, M.D.
LANDIS 6x30 Plain Type "C," Hyd. latest
LANDIS 10x24 — Universal — Type "C" — Hyd. — Latest
NORTON 10x18 Plain—motor drive
NORTON 10x36" Plain Type C, Hyd., latest type
NORTON 16x72 Plain, Type C—latest type

GRINDERS—Internal, Cutter and MISCELLANEOUS

BROWN & SHARPE #10 Tool & Cutter—latest
BRYANT No. 16—16" Chucking—Internal—latest
BRYANT #5 Internal, hyd., latest type
FITCHBURG Uni., spline shaft, hyd.
GLEASON #12 cutter grinder
HEALD 72A3 Sizematic internal, latest type
HEALD 72A5 plain internal dial type, latest type
LEBLOND #2 uni., tool and cutter, latest type
PRATT & WHITNEY Contour Cutter—latest type
SELLERS #1 Tool—Motor Drive
SELLERS #2 Tool—Motor Drive
SELLERS #4T Uni., Tool—latest type

GRINDERS—Surface

ABRASIVE #3 22x8x12, M.D.
ARTER 8" Rotary Surface
ARTER 30" Rotary Surface—Hydraulic—latest type
ARTER Automatic Piston Ring
BLANCHARD #16A—Dial Type—motor drive
BLANCHARD #18-30" chuck—latest
BLANCHARD #27—42" Chuck—Latest
GALLMEYER & LIVINGSTON #35—8"x24"—Hyd.
MATTISON 12x16x48—Hyd.—latest
MATTISON 14x16x36—Hyd.—Latest
MATTISON 14x16x60—Hyd.—Latest
NORTON 10x36—Hyd.—latest

LATHES—Engine & Mfg.

AMERICAN 36x25' centers—Timken Bearing—2 carriages P.R.T. Taper Attachment—Latest Type
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BRIDGEFORD 36"x28', 36"x32', 36"x35' bed—2 carriages, M.D.
HARDINGE TR59—latest
HENDEY—12x54 centers—Mfg.—latest type
HOUSTON, STANWOOD & GAMBLE 42x25' bed
LeBLOND 13"x4' bed, 17"x14' bed, 20"x48" centers, Timken Mfg.—latest
LODGE & SHIPLEY 14x30" centers, Timken, latest
LOSWING 4x34, 4x60, 8x34, 8x108, 8x60—Timken Bearing—latest type
LOSWING 5x34" Model LR Auto. Timken, latest
MONARCH 12x30" centers—Timken—latest
NILES 48x10' centers—heavy duty—Timken Bearing P.R.T.—Latest Type
NILES 60x10' centers—heavy duty—Timken Bearing P.R.T.—Latest Type
NILES 60x15' centers—heavy duty—Timken Bearing P.R.T.—Latest Type
PITTSBURGH 50'x30' bed—M.D.
PRATT & WHITNEY—12x30" centers—Timken
PRATT & WHITNEY 16x30" centers, Timken, latest
REED PRENTICE 14x30" centers, Timken, latest
RIVET #918—latest
SPRINGFIELD 16x30" centers, 16x54" centers, Timken—latest

LATHES—Turret

GISHOLT #3, #4 Univ., Timken Bearing—latest
GISHOLT #3D Simplimatics—Timken—latest
GISHOLT #4L, 9" hole—cross sliding turret—Timken Bearing—latest type
GISHOLT #1L, #2L, uni., Timken bearing, latest
JONES & LAMSON #3, #5, #7C Univ., latest type—Timken Bearing
LIBBY #1H-5 Timken Bearing—latest 5½" hole
BARDONS & OLIVER #3, #5, #7 Timken Bearing—latest type
CINCINNATI ACME #1, #5W, Timken bearing, latest type
MOREY #G, #3, #4, Timken Bearing, latest
WARNER & SWASEY #3, #4, #5, Uni., Timken bearing, latest type
WARNER & SWASEY 1A, 4A, Uni., Timken bearing—latest type

MILLING MACHINES—Mfg.

BRIGGS Type 2A, production, HYD, latest type
BROWN & SHARPE #12 auto., Timken—latest
CINCINNATI 4-36 Hydro. Timken Bearing—latest
CINCINNATI #0-8 Vert.—Pl. Auto.—Timken Bearing—latest type—Rise & Fall
CINCINNATI #1-12, #1-18 Plain Auto.—Timken Bearing—latest type
CINCINNATI 48" duplex, automatic, SPD

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KEARNEY & TRECKER #1218 Auto.—Timken Bearing—latest type
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NICHOLAS hand, M.D.—latest type
OHIO Auto. 16"x72" table—Timken Bearing

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CINCINNATI #4 Timken Bearing, M.D.
CINCINNATI #4S, #5, high power, M.D.
KEARNEY & TRECKER #3K, Timken—latest
KEMPSMITH #4 Maximiller—Timken—latest

MILLING MACHINES—Univ.

AMES Bench, Timken Bearing, latest type, M.D.
CINCINNATI #2, dial type, Timken—latest
KEARNEY & TRECKER #3H—Timken—latest
ROCKFORD #2B—Motorized

MILLING MACHINES—Vertical

BROWN & SHARPE #5—motor drive
CINCINNATI #2, #4—Dial Type—Timken—latest
KEARNEY & TRECKER 2H, 2K, 3H, 3K, 4H, 4K, Timken—latest

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CINCINNATI 24" Crank—Motor drive
CINCINNATI48x48x20', 3 heads, AC, M.D.
CINCINNATI 36x36x8', 2 heads, AC, M.D.
CHANDLER 36x36x20', 4 heads, AC, M.D.
DETRICK & HARVEY 48x48x10', 12', open side
DETRICK & HARVEY 48x48x16' 4 heads, Hyd.
GRAY—48x48x16'—4 heads—A.C.—M.D.
GRAY 54x42x10', 2 heads, AC, M.D.
GRAY 60x48x16', 3 heads, AC, M.D.
HAMILTON 42x42x20', 4 heads, motor drive
LIBERTY 36x36x8', 3 heads, AC, M.D.
LYND FARQUHAR 26" Openside, motor drive
NBP 36x36x10' 3 heads, DC, M.D.
NBP 42x42x12', 2 heads, AC, M.D.
NBP 48x48x14', 16, 2-4 heads, AC, M.D.
NBP 54x54x12', 2 heads, box table, AC, M.D.
NILES 48x48x12'—Time Saver—3 heads, P.R.T., box table, D.C., M.D.—latest type
NILES BEMENT POND 96x80x20' box table, 4 heads, Hyd., PRT—motor drive
OHIO 42x42x20'—2 heads, AC, M.D.
PATCH 48x48x14', 4 heads, DC, M.D.
POND 48x48x16', 2 heads, AC, M.D.

SAWS

BRIDGEPORT #48W Abrasive
CAMPBELL #213, 401, wet abrasive, latest
GROB #OS-200 band, latest type
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PEERLESS 14x14 Hack; latest type

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LAMAIRE 18' Vert. Hydraulic—latest type
MOREY 10", 14" Vertical—latest type
NEWTON 15" vert. slotter, DC, M.D.
NILES 18" ver. slotter, DC, M.D.
PRATT & WHITNEY 6', 10" Vertical, Motor drive
ROCKFORD 24" Hyd.—latest

THREAD MILLING MACHINES

MOREY SHIELDS 12x120, 12x192—latest type
PRATT & WHITNEY 4½x12, Model C—latest
PRATT & WHITNEY 6x132—motor drive

MISCELLANEOUS

BARNES #2—single spindle—hone—Latest Type
BAUSH Radial Tapper—latest
BILLINGS & SPENCER 200, 400, 800 lbs. board drop hammer, latest type
FERRACUTE No. DG55, Drawing, latest type
FISCHER #1 Oil Groover, M.D.
LANDIS ¾" Bolt Threader—latest
LaPOINTE #3L Broach, horiz. hyd. 15 ton cap.
LeBLOND #2 horiz. Hone SS, latest type
LeBLOND #2 deep hole borer, latest type
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NILES 30"x50' deep hole borer, Timken—latest
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NEW—SPOT DELIVERY—POWER PRESSES

Make	Tons	Stroke	Type
(15) V & O #0	5	2"	OBI—Dial Feeds
(15) V & O #2	17	4"	OBI—Dial Feeds
(15) Wat-Farrel	25	3" up—3" down	C Frame—dbl action, dial feeds

SAWS
Kalamazoo Metal Cutting Band Saws, horizontal
SHEARS (Foot) Frederick complete 36" x 18G cap.
(Power) Frederick complete with motor, gauges, 10' x 16 G
BRAKES Press type, a 11 steel, Lynn Hydraulic, motor self contained, gauges 52" x 14 G

USED POWER PRESSES

Make	Tons	Stroke	Die Space	Shut	Type
(6) Wat-Farrel	7½	1½"	8½"x 12"	6"	SS, Single action, C Gap frame
Bliss #18	10	1½"	8½"x14½"	7"	OBI Geared
Max Ames	15	2"	9"x18½"	6"	OBI—Roller Feed 3" x 2"
Perkins #350B	20	2"	12"x 20"	9"	OBI—Serial #14370
Bliss #172A	22	1½"	5"x 4"	7"	End Wheel
Bliss #20	30	3"	14"x 22"	8"	OBI
Bliss #68C	35	1-2½"	21"x10½"	7"	Arch-DA
(3) Mystic #5A	40	6"	14"x 17"	14"	Embossing & Moulding for Plastics
Torrington	40	1-2"	23"x 16"	6¼"	SS-DA
Bliss #1B	43	3-6"	14"x 26"	8½"	SS-DA, Gap
(2) Bliss #52	45	2"	14"x 15"	9½"	SS-DA
Wat-Farrel	50	Eyelet			6 Plunger
Consolidated #54	60	3"	18"x 18"	12"	Trimmers—Shear
Bliss #57	75	2"	18"x 18"	11"	SS-Trimming
(2) Bliss #7	180	1½"-4½"	28"x 36"	15"	SS-DA, Geared, Air Clutch
Toledo #59½S	500	8"	31"x 31"	29"	SS-DA, Twin Drive
Lake Erie Hydraulic	1320	36"	80"x 60"		Pump and Motor 1943
Lake Erie Hydraulic	2500	36"	133"x120"	42"	Pump and Motor 1944

BRAKES—Press, Geo Ohl 10½' x 10 Gauge, motorized Press, D & K, apron type, 8' x 16 g, power
GRINDERS—Crankshaft, Landis 16" x 48"
RIVET COUNTERSINKING MILL—Farnham 36" reach
SHEARS—Power, Bliss 42" x 11 g, Bliss 24" x 3/16, American 12' x 5/16"
(7) TURRETS—Denver 6" motor in base air chuck, late
WELDERS—Spot—Ace 30 KVA 36" reach
Arc—Hobarts 150-250 Amp.
Arc—Lincoln 150 Amp.
Arc—Wilson 200 Amp.

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BLISS 304—58 ton, 8" stroke, 18" x 18" bed
CLEVE 10S— 90 Ton, 8" stroke, 22"x22" bed
CLEVE 14E—225 Ton, 1" stroke, standard bed
BLISS 7—180 ton, single and double act. 1½-4½" stroke, 24"x36" Bed
BLISS 7—88 ton, 4-8" stroke, Horizontal Horning
BLISS Hydro-Dynamic 100, 150, 200 ton adj. stroke, 30"x31" Bed
NATIONAL MAXIPUS NO. 6, 2000 ton. 12" stroke, 46"x54" bed
BLISS 88—226 ton, 10-30" stroke
BLISS 26A—800 ton knuckle
BLISS 27—1000 ton knuckle
CLEVE 14S—180 ton, 8-30" stroke
CLEVE 8K—800 ton knuckle, 6" stroke
CLEARING K 1800—42, 800 ton knuckle 6" stroke
TOLEDO 59½S—504 ton, 8" stroke 31"x 31" bed, twin dr.

Coco Stamps—24x48, 36x48, 48x48, 60x156
Pneumatic Drop Hammer 36x48 3000# Head
Hydraulic Presses 75 ton to 5000 ton
Planer, Cinci 60"x60"x14'—4 heads
300,000# Draw Bench (NEW) with motor generator for 40 ft. tube, single, double, triple heads

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2 Landis 3/4" Bolt Formers and Threaders, M.D.
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Woodward & Powell 42" x 42" x 36 ft. 4 Head Planer
Cincinnati 36" x 36" x 16 ft. Planer, M.D.
1 Lodge & Shipley 36" Swing by 44 ft. Bed, Selective Geared Q.C. Lathe, M.D.

National Machinery Exchange

128-138 Mott St., New York 13, N. Y.

McDONALD

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G & E 24" Cin. 32" Shapers
Cleveland O.S. Planer 36"x8', 2 hds.
Abrasive #3-B M.D. Horiz. Surf. Grinder
Cincinnati D. H. Planer 36"x36"x10', 2 hds.
Barnes geared Camelback Drill Press, 4 sp.
Bullard Vert. Turret Lathes, 24" & 36" S. Head
Defiance 3" Horiz. Boring Mill & Univ. #3-A
L & S 18x12' & 20'x10' 20"x8' Grd. Hd. M.D. & 28"x12' Lathes
American 24'x12 grd. hd. lathe, m.d. q.c.g.
Amer. 4-ton vert. Hydr. Broach
Blanchard Vert. Surf. Grinder, 26 rd. chuck.
Cincinnati #2 Centerless Grinder.
Colburn 60" & 72" Vert. Boring Mills
Cincinnati 1-M grd. hd., Univ. tool room Miller.
Cincinnati No. 5 H.P. grd. hd. S.P.D. Pl. Miller.
Milwaukee No. 3-B Vert. Miller grd. hd., m.d.
Cin-Bick 3' Super Serv. Radial
Gisholt 3R Grd. Hd. M.D. Turret Lathe
W.&S. No. 2A grd. hd. Univ. Turret Lathe, S.P.D.
Foster No. 2F Fostermatic grd. hd. Turret Lathe, M.D.

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84"x52' Putnam Geared Head Motor Drive —Equipped with 2 carriages—Inspection in Operation.

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TURRET LATHES—FOSTER No. 1-B Univ. Inc. 2 Wrenchless Chucks, etc. M.D.; also W & S No. 2-A Univ.
Available immediately—Also Many Other Tools
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2269 Woolworth Bldg. New York 7, N. Y.

THE LARGEST MACHINE TOOL PLANT IN THE U.S.A.

Eastern OFFERS FROM STOCK

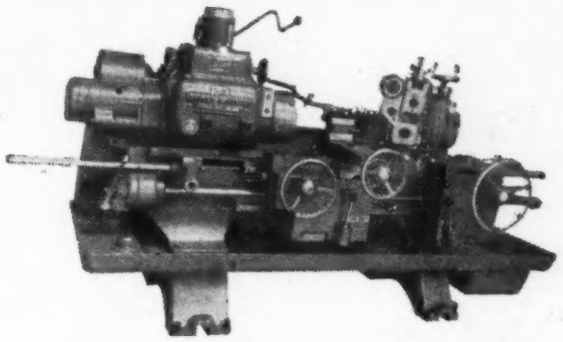
DEVOTED EXCLUSIVELY TO REBUILT MACHINERY

TURRET LATHES

No. 1 Cincinnati-Acme Semi-Universal, m.d., chucking
No. 1L Gisholt Universal, m.d., Timken, hardened ways, chucking
No. 1A Warner & Swasey Universal, m.d., preselector head, chucking, latest
No. 1A Warner & Swasey Universal, m.d., chucking
No. 1A Warner & Swasey Universal, m.d., bar
No. 2 Cincinnati Acme Full Universal, m.d., chucking, Timken, latest
No. 2 Warner & Swasey Geared Head, m.d., latest
No. 2B Foster Universal, m.d., chucking
No. 2L Gisholt Universal, m.d., Timken, hardened ways, chucking
No. 2L Gisholt as above, long bed type
No. 2G Morey Ram Type, m.d., bar
No. 2 Pratt & Whitney Shaver, m.d.
No. 2A Warner & Swasey Universal, m.d., preselector head, bar, latest
No. 2A Warner & Swasey Universal, m.d., preselector head, chucking, latest
No. 2A Warner & Swasey Universal, m.d., bar, late
No. 2A Warner & Swasey Universal, m.d., chucking, late
No. 3S Cincinnati Acme Fixed Center Universal, m.d., automatic chuck, latest
No. 3 Cincinnati Acme Universal, m.d., chucking
No. 3 Foster Geared Head, m.d., auto. chuck
No. 3L Gisholt, m.d., chucking
No. 3L Gisholt, m.d., chucking, cross sliding turret
No. 3L Gisholt, m.d., long bed type
No. 3 Warner & Swasey Ram Type, m.d., bar, latest
No. 3A Warner & Swasey Universal, m.d., bar
No. 3A Warner & Swasey, m.d., chucking
No. 3A Warner & Swasey, m.d., bar, latest type
No. 3A Warner & Swasey, m.d., chucking, Timken
No. 3B Foster Universal, m.d., bar
No. 4 Cincinnati Acme Ram Type, m.d., bar
No. 4 Gisholt Ram Type, m.d., chuck, latest
No. 4 Warner & Swasey Universal, m.d., preselector head, bar, latest
No. 4 Warner & Swasey Universal, m.d., preselector head, chucking, latest
No. 4 Warner & Swasey, cone motorized, chucking
No. 4 Warner & Swasey, cone motorized, bar
No. 4 Warner & Swasey Universal Geared Head, m.d., chuck
No. 4A Warner & Swasey Universal, m.d., Timken, chucking
No. 5 Jones & Lamson Universal Ram Type, m.d., chucking
No. 7 Bardons & Oliver Universal Ram Type, m.d., chucking
2½x24" Jones & Lamson Geared Head, m.d., bar
2½x24" Jones & Lamson Geared Head, m.d., chucking
2½" Jones & Lamson Universal Saddle Type, m.d., bar, latest
3x36" Jones & Lamson Geared Head, m.d., bar
3x36" Jones & Lamson Geared Head, m.d., chucking
2 spindle 3x36" Jones & Lamson Flat Turret, m.d., chucking
3¼" Cincinnati Acme Geared Head, m.d., chucking
3¼" Cincinnati Acme Geared Head Flat Turret, m.d., bar
3½x32" Jones & Lamson Geared Head Flat Turret, m.d., chucking
3½x32" Jones & Lamson Geared Head Flat Turret, m.d., bar
18" Libby Type A Turret, m.d., chucking
20" Acme Plain Turret, cone
Woods Tilted Turret Model D, cone
24", 28" Gisholt, cone

ENGINE LATHES

13x48" Pratt & Whitney Geared Head, m.d. in base, taper
14"x6' American Geared Head, m.d., taper
14"x6' Flather, cone
14"x6' Hendey Geared Head, m.d., taper
14"x6' Pratt & Whitney, cone, taper



14"x8' American Geared Head, m.d., taper
14"x8' Pratt & Whitney, cone
16"x6' Bradford, cone, taper
16"x6' Hendey Geared Head, m.d.
16"x6' Lodge & Shipley Selective Head, m.d.
16"x6' Sebastian, m.d. in base, latest
18"x7' Hendey Geared Head, m.d., taper
18"x8' American Geared Head, m.d., taper
18"x8' Lodge & Shipley, cone
18"x8' Greaves-Klusman, cone, taper
18"x8' Hendey Geared Head, m.d., taper
18"x8' Whitcomb-Blaisdell, Geared Head, m.d.
20"x48" centers Pratt & Whitney Geared Head, m.d., taper
20"x8' Cisco, cone
20"x8' Springfield Geared Head, m.d., taper
21"x12' LeBlond, cone
23"x12' LeBlond Geared Head, m.d., taper
24"x10' American Geared Head, m.d., taper
24"x10' Lodge & Shipley Selective Head, m.d.
24"x10' Hendey Geared Head, m.d.
24"x10' Whitcomb-Blaisdell, cone
25"x10' LeBlond, cone
27"x16' LeBlond, cone, taper
30"x12'6" Niles-Bement-Pond, m.d., taper
30"x13'6" Niles-Bement-Pond, m.d.
30"x26' Lodge & Shipley Selective Head, m.d., 2 carriages
32"x16' Bridgeford Geared Head, m.d., taper
36"x10' Putnam, cone, motorized
36"x12' Lodge & Shipley Selective Head, m.d.
36"x12' Wright, cone
36"x21' centers Putnam Geared Head, m.d.
36"x28'6" bed Niles H.D., m.d., latest
36"x30' Lodge & Shipley Selective Head, m.d., 2 carriages
36"x32' centers Putnam Geared Head, m.d.
38"x28' centers Niles H.D., m.d., latest
48"x204" centers LeBlond H.D., m.d., latest type, taper

HAMMERS

200 lb. Beaudry, m.d.
1100 lb. Bement Miles Single Frame Steam

MANUFACTURING LATHES

No. 9 Heavy LeBlond Multi-Cut, m.d.
3x80" LoSwing, s.p.d.
3½x36" LoSwing, s.p.d.
4x60" LoSwing, m.d., hardened ways, latest
8x84" LoSwing, s.p.d.
8x132" LeSwing, m.d., latest
9x12" Sundstrand Mfg., s.p.d.
9x14" Porter-Cable Mfg., m.d.
11x28" Reed, m.d.
13x24" Coulter Automatic Threading, m.d.
13x96" Automatic Threading, m.d.
15"x6' Automatic Threading, belt
16"x6' Cincinnati Mfg., m.d. in base
17x124" centers LeBlond Rapid Production, m.d. in base, latest
20"x8' LeBlond Mfg., m.d.
20"x16' American Geared Head, for spindle boring
32"x12' Gray Plain Turning, motorized
Niles-Bement-Pond Quartering Machine, new
No. 4 R. K. LeBlond Boring Lathe, 37' bed, 14'4" boring length, 13" hole in spindle, m.d., latest type (1945)

VERTICAL MILLING MACHINES

No. 2 Brown & Sharpe, s.p.d.
No. 2M Cincinnati, m.d.
No. 2 Cincinnati H.P., m.d.
No. 2H Milwaukee, m.d. in base, latest type
No. 2K Milwaukee, m.d. in base, latest type
No. 2½B Milwaukee, s.p.d.
No. 3 Cincinnati, m.d.
No. 3 Cincinnati, m.d. in base
No. 3B Milwaukee, m.d. in base
No. 3B Milwaukee, s.p.d.
No. 3V Toledo, s.p.d.
No. 4 H.P. Cincinnati, m.d., latest
No. 4 H.P. Cincinnati, m.d.
No. 4 Milwaukee, m.d.
No. 4H Milwaukee, m.d. in base, latest type
No. 4K Milwaukee, m.d. in base, latest type
No. 5 Brown & Sharpe, cone
No. 5 Jackson, m.d.
No. 5 Reed-Prentice, m.d., latest type
No. 6 Becker, cone
No. 28-60 Cincinnati 2 spindle Vertical Hydro-Tel, m.d., latest type

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Southwark Rotary Metal Cutter, 36" throat, cap. ⅜"
Niles-Bement-Pond Flanger, 8'x¼"
No. 2 Campbell Nibbler, 12" throat, ⅜" cap.
No. 4 Hilles & Jones Straightening Rolls, cap. 1" plate 8' long

SLOTTERS

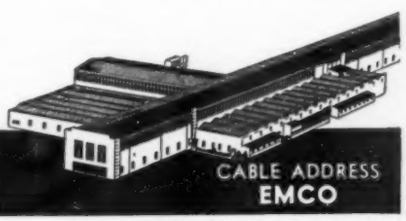
10" Newton, cone
12" Bement-Miles, m.d.
15" Canada, m.d.
18" Dill, m.d.
48" Niles-Bement-Pond Geared, reversing m.d.

TAPPERS

6 spindle ½" Acme Semi-Automatic Nut, m.d., latest
½" Rickert & Shaffer Vertical, belt

MISCELLANEOUS

Gisholt Precision Balancing, m.d.
No. 2 Cochran-Bly Filing, belt
Detrick & Harvey 2 spindle Profiler, belt
No. 12 Pratt & Whitney 2 spindle Profiler, belt
No. 12M Morey 2 spindle Profiler, m.d., latest
No. 11, 11S Cochran-Bly Saw Sharpener



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MElrose 1241
CABLE ADDRESS EMCO

AT REDUCED PRICES

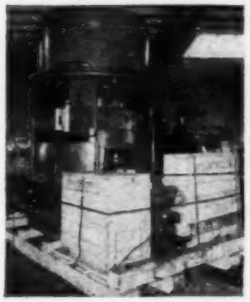
In Stock 1941 and 1942 Models

K & T Milwaukee Simplex Miller. Hill Acme Surface Grinder, 14x48 Magnetic chuck. 2—Barber Colman #3 Precision Gear Hobbers. Racine 14" Hydraulic Cut Off Saw. 2—Warner Swasey #3 with bar attachments. #4 Universal.

Older Models in Good Condition

Bullard 42" Spiral Drive Vertical Turret Lathe. Cincinnati #4 geared head Rectangular-Over Arm. Plain Miller. #2 Vertical with Rotary Attachment. Mitts & Merrill #4 Keyseater. Warner Swasey 3A Universal. 2A & #4 Universal. Wickes geared head Lathe. Q.C. 30"x27' C.C.

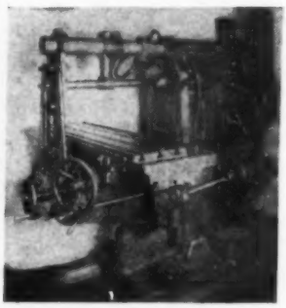
Cincinnati #3 Geared Head Miller. $1200.



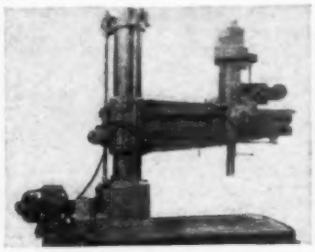
Bullard Multiaumatic 6 spindle. 12". $3500.

Late Automatic Screw Machines 1942 and 1943

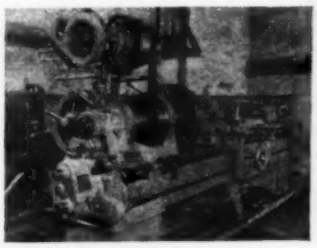
New Britain Gridley Model 60—6 spindle, 1", serials 27902, 27903, new 1943.
New Britain Gridley Model 61—6 spindle 1⅝", new 1942.



4B Brown & Sharpe Plain Miller, geared head. $1200.



Cincinnati Bickford 6' Radial Drill. $1500.



American 24"x96" ce Engine Lathe motor, chuck. $1450.

Devlieg Model 31 Super Mill. $850.

GENERAL MACHINERY AND EQUIPMENT CO.
180 S. 15th STREET
HARRISBURG, PA.
Warehouses in Harrisburg, Lancaster and Philadelphia, Pa.

PUNCH PRESSES

IMMEDIATE DELIVERY FROM STOCK

No. 4½ BLISS, 80-100 Ton Capacity straight side punch press, late model with scrap cutters, double roll feeds, bolster. 10 H.P. motors and controls, forced feed lubrication. 21x27 bolster 4½" stroke. In both Single and Double Action Models. Like new.

No. 6 BLISS 90-125 Ton Capacity, straight side Punch Presses, late model. With scrap cutters, roll double roll feeds, bolster, 15 Hp motors and controls, forced feed lubrication. 25x30" bolster, 5½" stroke. In both Single and Double action models. Like new.

#3 Niagara OBI Punch Presses, 25 ton cap., good cond.

1—#87 BLISS Press, 175 Ton cap. 32" stroke, late model.

#666 Toledo, Knuckle Joint Press. 1000 ton cap. 37x21 bolster, 2½" dist. bed to slide, good condition, all electrical equipment.

SPOT WELDERS IMMEDIATE DELIVERY 5-300 KVA, Brand new. 5 year guarantee.

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LATE TYPE—

12"x30" LeBlond Grd. Hd., M.D., Lathe
16"x30" Monarch Grd. Hd., M.D., Lathe
18"x48" Monarch Grd. Hd., M.D., Lathe
22"x48" Monarch Grd. Hd., M.D., Lathe
22"x48" L. & S. Grd. Hd., M.D., Lathe
22"x11' Lehman Grd. Hd., M.D., Lathe
#2 Cin. HS. Dial Plain Mill
No. 3K—K. & T. Plain Mill, M.D.
#4—48" Cin. Hydro Dup. Mill
No. 1A—W. & S. Preselect Grd. Hd., Uni.
3'9" Cinci-Bickford Radial Drill, M.D.
3'11" Cinci-Gilbert Radial Drill, M.D.
4'11" Carlton Radial Drill, M.D.
6 Spindle No. 3B Edlund Drill, M.D.
B225-H Natco, 16 Spindle Drill, Hydraulic, M.D., No. 2 M.T.
No. 25A Heald Rotary Surface Grinder, 16" type A B & C Gear Hobber
#3 B & C Gear Hobber
#3 Cinci. centerless Grinder

New Logan Lathes, all models in stock
7" Logan shapers M.D.

GEORGE M. BERNSTEIN & COMPANY
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UNUSUAL VALUES

Blueprint machines, printer-washer-dryer
Rivett Ball Brg. Precision Screw-Machine
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Drills, high speed single & multiple spindle
Drills, 21" Royersford Bk. Grd. Pr. Feed, New
Drills, sensitive, 2 and 4 Spindle
Drill, #25 Foot-Burt ,motor driven
Drills—New—18" Royal Motor driven (10)
Gear cutter, Brown & Sharpe #3—26
Gear Cutter, Gould & Eberhardt 42"
Grinder, Webster and Perks #1-¾ motor drive
22" Buffalo Pr. Fd. Motor Drive, New
16"x6' Hendey Lathe, Quick Change Gear
Magic Chucks #1-2 & 3 and Collets
Pipe Machine, 3" Oster motor drive
Planer 24"x24"x6' Pease, motor drive
Punch & Shear, two ½" & ⅝" capacity
Shaper, 24" Gould & Eberhardt
Turret Lathe, 2" Acme & Warner & Swasey
Welders—Arc & Spot in Stock—New

Outfit: about 27 fine machine tools, drills, lathe, and 5 milling machines, pulain and Uni. Tel us definitey what you want as our list is incomplete and only partial.

The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO

RADIAL DRILL

5' CINCINNATI BICKFORD SUPER SERVICE RADIAL. 15" column, box table. 36 spindle speeds, 18 feeds. 15 HP 3/60/220 motor on arm.

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Bolt Cutters 1"-1½"-2"-2½" Acme Landis
Boring Mills, 36"-42"-52"-72"-96"
Drills, Radial 6' Cin. Bick., 5' Carlton.
Lathe, Turret 3-A W. & S. S.P.D.
Millers, Plain No. 3 K & T. No. 4 Cin.
Planer, 36"x36"x12' Powell 4 Hds.
Profiler, #13 P. & W., B.D.
Shapers, 16"-20"-24"-36"
Shaper, 36" Morton Draw Cut

West Penn Machinery Company
1210 House Bldg. Pittsburgh, Pa.

FOR SALE
CYCLONE FURNACE
Type 4860 EH Lindberg Engineering Co. Cyclone Furnace complete with all controls, instruments etc. Like new. Reasonable.
UNIVERSAL DREDGE MFG. CO.
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SIMMONS BEST BUYS

BORING MILLS

9" Bar BETTS Horizontal floor type, 50" face plate, 8'—vertical travel, modern, 4-motors.

3" & 4½" Bar Universal TRI-WAY Horizontal Boring Mill, P.R.T.
No. 35 LANDIS Horizontal floor type
24" New Era, BULLARD
72" KING, Two Swivel Heads.
96" CINCINNATI, 2 swivel heads.
12' BETTS Heavy, Double Drive
14' BETTS (Consolidated) late type.
14-20' N.B.P. Extension type boring—2 swivel heads, all geared feeds
16' N-B-P 2 swivel heads.

MILLERS

24"x24"x16' INGERSOLL Planer type.
36"x36"x10' INGERSOLL Slab
Nos. 2 and 4 CINCINNATI High Power Vertical, Power rapid traverse.
No. 5 CINCINNATI Plain Rectangular overarm table 83"x21".
No. 3-36 CINCINNATI Duplex Hydromatic
6"x14" PRATT & WHITNEY, thread.
No. 3 KEMPSMITH Maximiller.
Nos. 3 and 4 CINCINNATI Plain.

LATHES

30"x18' AMERICAN 12 Speed, G.H.
36"x32' NILES, "Timesaver".
42"x34' LEBLOND late type
30"x34' LEBLOND Gun Boring.
48"x30' SIMMONS, Geared head.
60"x30' NILES Heavy Duty Geared Head, M.D. (Built 1942).
60"x40' Centers MACKINTOSH-HEMPHILL Heavy Duty Geared Head M.D. (Built 1942).
90" PUTNAM Driving Wheel Lathe with journal truing and Double Quartering
No. 2-H LIBBY, Full Universal Cross Feeding Turret, Taper Attachment, M.D.
3-AL GISHOLT, Hardened Ways.

DRILLS

8' AMERICAN Triple Purpose Radial, Motor-on-Arm, 230-V., D.C.
Nos. 310 & 314 BAKER H.S.

GRINDERS

No. 2 CINCINNATI centerless grinder.
24"x20' Centers NORTON Plain. Cylindrical individual motor drive to work spindle, wheel spindle and table.
20"x96" LANDIS, plain cylindrical.

GEAR HOBBERS

No. 5 Pfauter, spur, helical and worm, 130" dia. capacity.

100" GOULD-EBERHARDT, Hobber Horizontal, for spur, helical and worm gears, capacity diameter 101", face 48".

PLANERS

48"x48"x20' N-B-P 4 heads.
48"x48"x32' GRAY Spiral Drive, four heads.
72"x72"x15' N.B.P. 4 Hds, 230-volt.

14'x9'x35' Capacity Detrick & Harvey Convertible openside, 2 rail heads, 2 side heads, traveling outer support, 230 V.D.C.

60"x60"x18' CLEVELAND Openside.
84"x60"x18' DETRICK-HARVEY Convertible Openside, 230-volt, D.C.
120"x96"x20' CINCINNATI Rapid Traverse, 230 volt, D.C. reversing type planer motor and control, 4 heads.

SHAPERS—SLOTTERS

6" & 10" PRATT & WHITNEY Vertical.
15" BETTS Heavy Slotter
18" NILES-BEMENT-POND Heavy Slotter.
21" NILES-BEMENT-POND Slotter, M.D.
32" CINCINNATI crank shaper.
36" MORTON Drawcut, Rotating Arbor, Geared Feeds, P.R.T., M.D.

MISCELLANEOUS

30"x⅜" N-B-P Bending Rolls
No. 2 PRATT & WHITNEY Jig Borer with 22"x44" table.
60" NEWTON Cold Saw, M.D.
48" MORTON Keyseater
24'x1½" N.B.P. Plate Planer.

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28" Cincinnati Bickford Sliding Head
32" Cincinnati Bickford, Sliding Head
6' American, Radial
4' Fosdick Radial
Baush Multiple Spindle, 8—#3 M.T. Spindles

GRINDERS

#33 Abrasive Surface
Model B Thompson Hydraulic, 12"x24" Surface
#2 Cincinnati Centerless

LATHES

12"x6' LeBlond Geared Head
15"x6' Sidney
16"x6' Porter-McLeod, Geared Head
17"x6' Lehman Hydratrol
17"x6' LeBlond, Taper Attachment
19"x8' Sidney
20"x22' Reed Prentice, Geared Head
27"x8 Bridgeford.

MILLERS

#2 S.P. Van Norman, Plain, Motor Driven
#2 Brown & Sharpe Plain, Motor Driven
#2 Cincinnati Vertical, Dial Type, Motor Driven
#4 Cincinnati Universal, Motor Driven

TURRETS

#2B Foster Universal
#2A Warner & Swasey
#4 Warner & Swasey

DELTA EQUIPMENT CO.
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84" Cincinnati HYPRO Vertical Boring Mill
#18 Blanchard Surface Grinder, 30" Chuck
16"x72" Norton "C" Plain Grinder
#262 Barnes Upright Drill, box column
5'-17" Cincinnati-Bickford Super-Service Radial
7½" 6-spindle Goss & DeLeeuw Automatic Chucker
#2L Van Norman Plain Miller
8"x48" J. & L. Thread Grinder
#3, #4, and #5 Warner & Swasey Universal TURRET LATHES

ALL LATEST TYPE MACHINES

HAZARD BROWNELL
350 Waterman St., Providence 6, R. I.
Dexter 8880

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1—500 lb. Standard Automatic Drop Hammer, New
36" Bullard Vertical Boring Miller, spiral drive, 1942
#2H Kearney & Trecker Vertical Miller
3—#4H Kearney & Trecker Vertical Miller
#1-18 Cincinnati Plain Automatic Miller, 1944
#1-12 Cincinnati Plain Automatic Miller, 1941
#4 Warner & Swasey Universal Turret Lathe
#5 Jones & Lamson Universal Turret Lathe
#2 Bardons & Oliver Turret Lathe, 1944
#7 Bardons & Oliver Universal Turret Lathe, bar feed.
#12M Morey 2-spindle Vertical Profiler
#13 B & S Universal Grinder
#70A Heald Internal Grinder, $1500.00

REYNOLDS MACHINERY CO.
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5" AJAX
UPSETTER, M. D.
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⅝" & 2" Cleveland Model B
12"x63" & 14"x19" Fay
14"x18" Monarch Magna-Matic
6"x6¾" Goss & DeLeeuw
No. 454 New Britain chucking
Gisholt simplimatic

BORING MILLS
100" Niles Bement Pond heavy pattern
96" Cincinnati Massive Pattern
60" Colburn
53" Niles Bement Pond
42" & 24" Bullard V.T.I.

DRILLS
4' Hammond sensitive radial
18" Walker Turner radial
No. OOS Natco
Garvin duplex
21"x74" Munson double end
4-spdl. #3 Leland Gifford
24" Kokomo upright
24", No. 25 Foote Burt Heavy Duty
34-spdl. #30 Natco

LATHES, TURRET
Nos. 4 & 5 Warner & Swasey universal
Nos. 3-B & 5 Foster universal
Nos. 3 & 5 J. & L. universal
16"x6' South Bend
Nos. 3 & 5 Foster
24" & 42" Bullard vertical
28" Gisholt
3"x36" Jones & Lamson

PRESSES
12 ton U.S. OBI
#10 Bliss straight side
8 & 20 ton General Flexible
35 ton Metalwood straightening
65 ton Watson Stillman straightening
500 ton Southwark hydraulic
1000 ton Lake Erie hydraulic

SHAPERS
16" Gemco (new)
20" American
24" Gould & Eberhardt
32" Morton draw cut

UPSETTERS
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2½" National, latest type with air clutch & guided ram
3" National

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Nos. 1, 2 & 3 Sundstrand balancers
No. 3 Gardner buffer
1400 CU. FT. Sullivan compressor
173 cu. ft. Ingersoll compressor
Nos. 2 & 3 Cincinnati centerless grinders
No. H-1 Micromatic Hydrohoner
#211 Barnes honer
No. 1½ Baker keyseater
No. 9 LeBlond multi-cut lathe
6", 8" and 15" Sundstrand automatic stub lathes
#12-B Pratt & Whitney profiler
Cleveland sand cutter
6", #401 Campbell abrasive saw
Model J Radiac abrasive saw
#11-B Badger alligator shear
4" Stevens die slotter
16" Bement Miles slotter
#2 Garvin tapper
2" #22 Murchey threader
90 KVA Fisher body seam welder

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SAGINAW, MICH.

Rebuilt by EXPERTS ONLY
Botwinik Machine Tools Keep Production UP Costs Down

1—Putnam 84"x84"x40' Dbl. Hous. Planer, Revers., M.D. and controls, 2 heds. on cross rail, 2 side heds. Just taken out of service.

1—Amer. Fndry. and Mach. Co. 30"x30"x10', 1 hed. on cr. rail, 1 side hed., Openside Planer, M.C.

1—Bridgeford 36"x56', 15 speed, grd. hed., Eng. Lathe, M.D., AC elect. equip., power rap. trav. to carr., compound rest, 2 steady rests, sw. over bed 38", sw. over carr. 26", dist. betw. cens. 48'.

Whitcomb-Blaisdell 20"x24' and 24"x10', QCG. DBG. Eng. Lathes, M.D.

1—Amer. 24"x12', 12 speed, Eng. Lathe, M.D., sw. over bed 27½", dist. betw. cens. 84".

1—Amer. 20"x12', Eng. Lathe, ast. sw. 26", 2" rising blocks, dist. betw. cens. 90", 12 speed, grd. hed.

1—Amer. 4'12" col. Trip. Pur. Radial Drill, M.D., 32 speeds, No. 5 Morse Taper, box tbl.

2—Cin.-Bick. 5'13" col. Pl. Radial Drill, M.D., 24 spin. speeds, No. 5 Morse Taper.

Bullard 24", 36", 42" New Era Type, Bullard 36" "Spiral Drive" and Bullard 60" Vert. Boring Mills, M.D.

1—14' Sellers, 2 heds. on cross rail, elect. equip.

B. & S. No. 2B Pl. Miller, dbl. overarm, timk. bear., motor in base, tbl. wkg. surf. 46¾"x11¼", auto. power long. 28", cross 10", vert. 19, spin. speeds 21-496.

1—B. & S. No. 3A Univ. Miller, dbl. overarm, motor in base, tbl. wkg. surf. 55½"x14", power feed long. 34", cross 12", vert. 19".

1—Cin. No. 3 Hi-power Pl. Miller, tbl. wkg. surf. 55¾"x10½", power feed long. 34", cross 10", vert. 20".

1—Van Norman No. 3 Duplex Miller, with high speed mill. attmt., 12 speeds, tbl. wkg. surf. 48¼"x10", power feed long. 32", cross 12", vert. 18⅞".

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of Mass. Inc.
3 SHERMAN ST., WORCESTER 1, MASS.

ENGINE LATHE
48"x22' Niles-Bement-Pond Geared Head Motor Drive—Purchased new 1941—Very Attractive Price Before Removal.

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TRIMMER & REHEADER
Hopper Feed
#202 #2½ V&O md. Trimmer

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AND COMPANY, INC.
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POWER PRESSES
30 TONS, TOLEDO #3½ OBI, 3" Stroke

18 TONS, PRESSRITE #2—NEW OBI, 2" Stroke

10 TONS, PRESSRITE #1 OBI, 2" Stroke

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BROOKLYN, N. Y.

FOR SALE
#350-F GIDDINGS & LEWIS Floor Type Horizontal Boring, Drilling and Milling Machine. 5" spindle. 72" vertical and cross travel. 15 HP 60 cycle motor. New in 1942.

10' CINCINNATI HYPRO Vertical Boring Mill. 2 tilt heads on rail. Electrical equipment. New in 1941.

FS-837, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

LATE TYPE
5' CINCI. BICKFORD RADIAL DRILL
New 1942, 17" col., 2 way base, AC motors, coolant system, elec. col. clamp; M.D. P.R.T. to head, 19,500 lbs.

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NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders.

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Low Temperature Freezing Unit

Cascade Model 120, only slightly used, in perfect condition, for sale, price reasonable. If interested write

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337 West Madison Street, Chicago

HEAT TREATING FURNACE

Delaware Model B with Brown automatic controls and recording pyrometer. Inside 10x7x22; temperature to 3000° F. Complete with centrifugal blower. Excellent condition.

FS-835, AMERICAN MACHINIST
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No. RD1175J Walker Turner Radials, M.D. (4)

24" Cincinnati Box Col. Upright (1942)

3'11" American "HOLE WIZARD" Radial (1942)

3'11" Morris "MOR-SPEED" Radial (1942)

7'17" Fosdick Radial (1942)

24" Bullard Vert. Turret Lathe, Spiral Drive

4" Bar Universal table type horizontal Boring Mill, 1942

36" King Vert. Bor. Mill. Side Head

#340-F Giddings & Lewis Mill (1942)

No. 1H-12 Kearney & Trecker Mfg. Miller (1941)

#4 Cincinnati Pl. Miller (1942)

No. 5H Kearney & Trecker Pl. Miller (1941)

#4 K&T Vert. (1942)

No. 0 Brown & Sharpe Wire Feed (3)

No. 4 Warner & Swasey Univ. Turret—1942 (4)

No. 5 Warner & Swasey Univ. Turret—1942

No. 5—2½" Jones & Lamson Univ. Turret—(1942)

No. 1A Warner & Swasey Turret, Timken (3) 1941

No. 2A Warner & Swasey Turret, Timken (2) (1941)

No. 11 Blanchard (2), (1942)

#10 B & S Cutter & Tool Grdr.

No. 4T Sellers Tool Grinder (never Used)

72A3 Plain Heald Internal Grinder, 3 motor drive for Tool Room—(1942)

4"x12" Landis Type H Plain Grinder, (1942)

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22"x96" Monarch Model "M" Lathe (1944)

42"x132" Centers American Lathe, M.D. (1942)

50"x17' Centers LeBLOND Lathe, M.D. (1942)

Wigglesworth Machinery Co.

203 Bent St. Cambridge, Mass.

BORING MILL or VERTICAL TURRET

36" Bullard "New Era", with side head, form cutting and threading attachment. Serial No. 11177.

With or without motor. In very good condition. Immediate shipment.

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2½" Cleveland Spd.
2½", 4" Binsee
66" Niles
54" Colburn, M.D., 2 hds.

TURRET LATHES

Foster Nos. 4, 5, 6, 1B, 3B M.D. Univ.
J. & L. 2¼"x24", 3¼"x36".
Acme 3¼" M.D.
No. 1L Gisholt Univ. M.D.

GRINDERS

P. & W. 14", 18", B.B., Vert. M.D.
Blanchard 30", M.D.; Modern 12x48" M.D.
Norton Hydraulic 12x18", M.D.
Heald Nos. 72A3 Gagematic
Norton 50"x28', M.D.
Landis Type A 6x20" Hydraulic, M.D.
Bryant No. 12, M.D.
No. 55, 60, 65 Heald Int. Hydraulic, M.D.
12" Heald Rotary Arter 12" M.D.
B. & S. No. 2, 2B Surface, M.D.
B. & S. No. 10 1 Cyl.
No. 2 Cincinnati Centerless M.D.
B. & S. No. 1, 3 Universal
#25, #55 G. & L. M.D.

LATHES

Monarch geared head
McCabe 26-42"x14'
26x12' Boye & Emmes 3 step cone, B.D.G.
14"x6', 16"x6' Hendey
9" LeBlond Automatic
36x30' Putnam M.D.
36x22" Putnam, D.C. M.D.
32"x35' Wickes
Putnam 42x16', M.D. S.C.G.
P. & W. 1x18, 1¼x18 Automatic Lathes

AUTOMATICS

B. & S. No. 2, Hand Screw
Cleveland Model A ½", ⅞", 1¼", 2"
Cleveland Model B 1", 2"
P & J 6A, M.D.
⅞" Cone 4 spindle

New in Stock—Power Shears 52"-72"

Spot & Arc Welders
5, 10, 18 ton OBI Power Presses
7" Ammco Shapers
H.S. Vertical Milling Heads, Drill Presses, Foot Presses
Kalamazoo Metal Band Saws
8" Shap-Rite Shapers
No. 1½ Abrasive Surface Grinder
6x6" Racine Hacksaw

RADIALS

4', 5', 6' American Triple Purpose
4' Cincinnati-Bickford
4' Muller, M.D.; 4' 5' Western, S.P.D.
4' American Hole Wizard, M.D.
4' Fosdick

MILLING MACHINES

Cincinnati, #2 Univ.
No. 3S Cincinnati, S.P.D. rapid trav. M.D.
Nos. 1Y, 0Y, 3, 4 5 B & S Plain & Univ.
B. & S. Nos. 12, 13, 13B
Hall Planetary Model D Thread Miller
Becker Nos. 3, AB, 5, 6, Vert.
Nos. 3, 4, Cincinnati Vert.
P. & W. No. 12, 30 Profiler M.D.
K. & T. B. & S., No. 2, 3 like new
B. & S. No. 1, 3, Vert.
No. 8D, Gorton Vertical, M.D.
#3 Van Norman Universal
#2 Conradson Universal
#26 Van Norman Univ.

MISCELLANEOUS

Gorton No. 1S Engraving Machine
6 spindle Avey Drill 15" overhang
Rochester No. 5½" B Hammer
6" Vertical Shaper P & W
Oster Pipe Machines, 4", 6", M.D.
N.B.P. 15" Slotter M.D.
10x10 Peerless Universal Shaping Saw
#7 72 Fellows Gear Shapers
Lennox Throatless shear ¼" cap., M.D.

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MONA

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8"x108" Fitchburg Lo-Swing
12"x18" Lipe Carbo
18"x6' American Grd. Hd.
18"x48" Monarch, Keller attachment (1942)
20"x10" Lodge & Shipley Grd. Hd.
22"x48" Monarch, (1943)
36"x30' Lodge & Shipley Triple Geared Selective Head, two carriages
42"x18' Putnam Geared Head

MILLING MACHINES

#3 Milwaukee Vert. M.D.
#3K Milwaukee Vert.
No. 4 Cincinnati Plain, Motor Drive
No. 4K Milwaukee Plain Late Type
No. 118 Van Norman Production
24" Cincinnati Production
Taylor & Fenn Spline
No. 27MB Smalley General Thread
#2 Hanson-Whitney Thread
No. 6 Lees-Bradner Thread
26"x25"x12' Ingersoll Adjustable Rail
42"x36"x14' Ingersoll Adjustable Rail, four heads

DRILLS

No. 2-8 Spdl. Leland-Gifford
7' American full Universal Radial
7'-17" Col. Fosdick Economax Radial

VERT. BOR. MILLS

34" King
42" Bullard New Era Vertical Turret
72" King, Motor Drive

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No. 50 Universal, 5" Bar, 60x144" Table, Maximum Bar to Table 72", Maximum Bar to Outboard 120".
2½" Bar Universal, Motor Drive

GEAR MACHINES

No. 7 Fellows Gear Shaper
12" Michigan Gear Shaver

PLANERS

36"x36"x8' Woodward & Powell

TURRET LATHES

No. 2 American Brass Lathe
No. 2 Brown & Sharpe, Wire Feed
#3 W & S Univ. Bar Feed
#4 W & S Univ. Speed Selector
No. 1-A W & S Univ. Speed Selector
No. 5 Jones & Lamson Univ.,
No. 4-A W. & S., 8" hole
#4—W & S 1½" Screw Machine
#6—W & S 2" Screw Machine
#6R Denver Univ. 2-9/16" capacity
18" Libby—3½" Hole—M.D.

GRINDERS

6"x18" Norton Hydraulic Plain
6"x30" Norton Hydraulic Plain
23"x36" Norton Plain, M.D.
14"x168" Norton Plain, Late Type
#22—12" Heald Rotary Surface
10"x24" Landis Universal, M.D.
No. 16 Blanchard Surface, 26" chuck
No. 34 Abrasive surface
No. 2 Cincinnati Tool & Cutter

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MODERNIZED & MOTORIZED CYLINDRICAL GRINDERS

SIZES AVAILABLE

10x18	14x36	16x 50
10x36	14x50	16x 72
10x50	14x72	18x 96
10x72	14x96	18x 96
10x96		24x240

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651 Washington Boulevard
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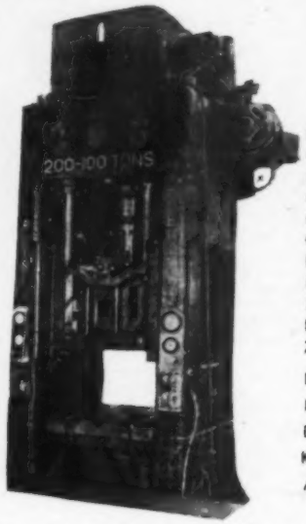

Bliss 200 ton double action hydro dynamic 44"x32" stroke. Bed 48"x38". Will draw and lift out 17".

Late Type POWER PRESSES
from 4 ton to 2500 ton

MODEL	TONS	STROKE	SHUTHEIGHT	BED
Bliss	200	44" & 32"	35"	40x38
Clearing	75	12"	28½"	36x42
Clearing	75	8"	20"	22x20
Clearing	200	30"	24"	42x36
Clearing	250	22"	24"	26x30
Clearing	800	6"	24"	42x36
Henry & Wright	15	4½"	11⅜"	30x15
Bliss #304	60	2½"	11⅜"	18½x18½
Bliss #4½	70	1½x4½"	11x14½"	21x27
Bliss #6	125	2x5"	9x11"	30x24
Z & H #16	250	16"	11"	21x21

HYD. PRESSES: Lake Erie presses from 75 to 200 ton.
Baldwin Southwark 200 ton 21" stroke, 3' bet. tie-rods.
BERTSCH BENDING ROLL—4' cap., 1" max. plate
KLING 60" BENDING ROLL—max. cap. 3" thick mild steel.
AETNA STANDARD—plate bending machine, 4 roll type. Capable of handling steel ¾" thick. Brand new.

SMITH & MILLS 16" Shaper, Vernon 12" Shaper, National ¼" Nut Tapper.

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PROMPT SHIPMENT

BOR. MILLS, 2½" bar, Cleveland, M.D.
BORING MILLS, 3" and 4½" bar Universal.
BORING MILL, No. 0 G & L, 3⅛" bar.
BORING MILL, Hor. 3½" Landis, Floor Type.
BOR. MILL, 36" Bullard, "New Era"
BOR. MILL, 36"-44" N-B-P, Tur. & Side Hds.
BOR. MILL, 42" King, Tur. & Side Hds.
BOR. MILL, 60" N-B-P, 2 heads, M.D.
BORING MILL, 40" King, 2 Hds., M.D.
BROACH, Hr. Hyd. XA Oilgear, 60" stroke.
BROACH, Vert. Hyd. SRV5-42" LaPointe.
DRILL, Hvy. Duty, No. 513 Baker, No. 6 M.T.
GRINDER, Internal, No. 72A5 Heald, 2 Mtr.
GRINDER, Plain, 14"x72" Norton, M.D.
GRINDER, Surf. No. 5 Abrasive, 14"x48".
GRINDER, Surf. No. 16 Blanchard, M.D.
HAMMER, Board Drop, 1,000#, B & S.
HOISTS, Monorail, 3 ton Detroit.
LATHE, 36"x22' N-B-P, Grd. Bd., Q.C.G.
LATHE, 38"x19' Putnam, Grd. Bd., Q.C.G., T.A.
LATHE, 42"x50' Putnam, Grd. Bd.
LATHE, 54x34' Johnson, Hvy. Duty
LATHE, Turret 6W Acme, 3" h.s., Mtr. in base.
LAPPER, No. 1 Micromatic Hone (New)
MILLER, Duplex 24" Cincinnati Auto.
MILLER, Plain, Nos. 3S, 4 & 5 Cincinnati.
SHAPER, 16" Milwaukee, M.D.
SHAPER, Vert. 10" Pratt & Whitney.

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16"x6', GEARED HEAD, QUICK CHANGE BRAND NEW
IMMEDIATE DELIVERY
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RADIAL DRILL, 3' Arm, American
PORTER CABLE SANDER, BG-8

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Collets for Gridley Model F, ¾", ⅞", 1¼", 1⅜", 1¾", 2¼, 2⅜", Automatic Mach.
Extra large stock of 2⅜" R.A. 6 Gridley parts and collets.

We have a large stock of used collets and parts for Acme, 52, 53, 55 & 56, Acme Gridley, Cleveland, Cone, Foster, No. 4 and No. 6 Warner & Swasey, Bardons & Oliver, Brown & Sharpe, Garvin and New Britains.

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VERY LOW PRICE on this powerful high production lathe, 60" centers; geared head; 9 speeds on carriage, 6 speeds on spindles; 8 tools and cross slides; 5 h.p. 3 ph. AC motor; hardened steel ways and gears. For work on heavy steel forgings; does several operations at one time.

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HENDEY CENTERING MACHINE
ARR. for M.D.

RANO BRONZE CORP.
CLEARFIELD and WITTE STREETS
PHILADELPHIA 34, PA.

WANTED

WANTED

Automatic Browne & Sharpe Screw Threading Machine, #00G High Speed. Late Models.

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¼" and ⅜" Diameter hardened steel balls. Advise price, quantity, grade, and availability.

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1—8' x 10 ga. press brake.

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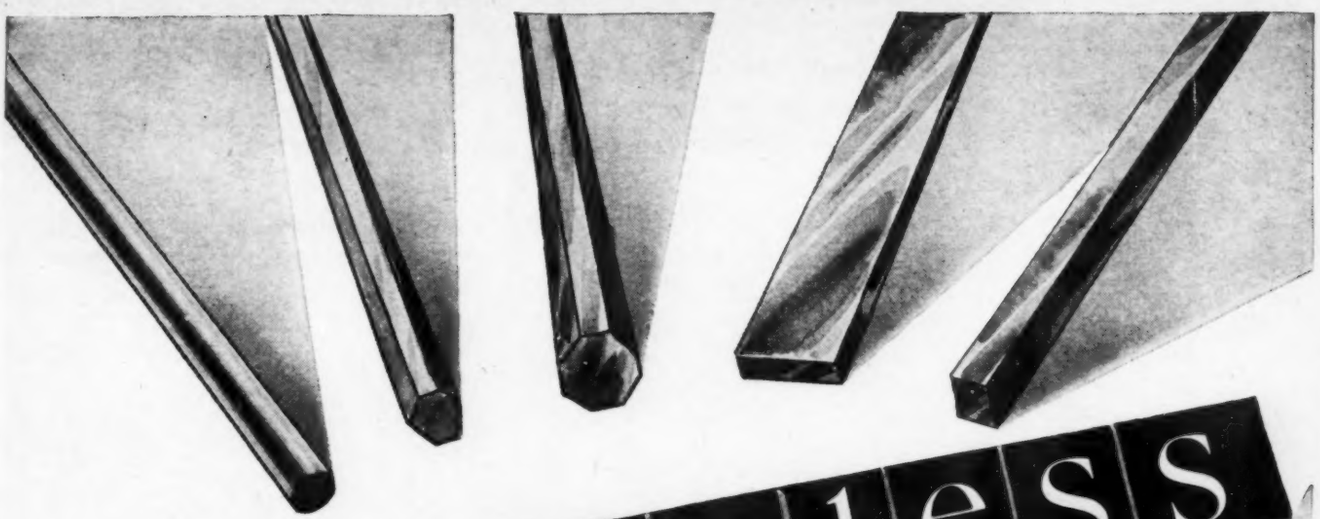


stainless STEEL

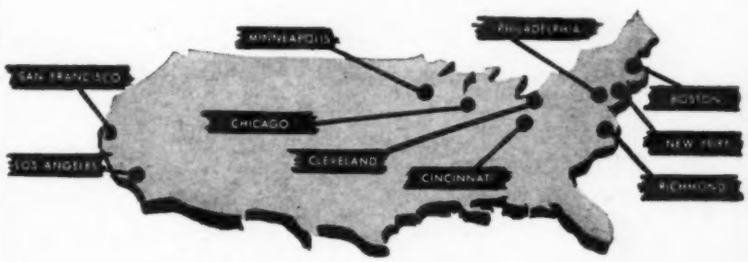
ONLY 10c PER POUND

FOR TOP QUALITY BARS AND PLATES IN PRODUCTION-RUN QUANTITIES

Think of it! Here's the steel you need *now*—priced far below mill prices. Warehouses must be cleared quickly for other surplus. Hence this amazing bargain today.

At this price you can afford to stockpile even against next year's requirements—for these savings will pay storage and interest charges over a long, long time.

Order today from any War Assets Regional Office. But for quickest delivery and less risk of disappointment, order from these offices which have the stock on hand:



types available:

302, 303, 304, 347, 416, 420, 431, 440. Rounds, hexagons, octagons, flats, squares.

Also fair quantities of stainless steel tubing at about 50% discount from net mill prices f.o.b. location.

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Orders not accepted for less than 5000 lbs., except where the inventory of any individual item is less.

The material offered is subject to withdrawal prior to shipment.

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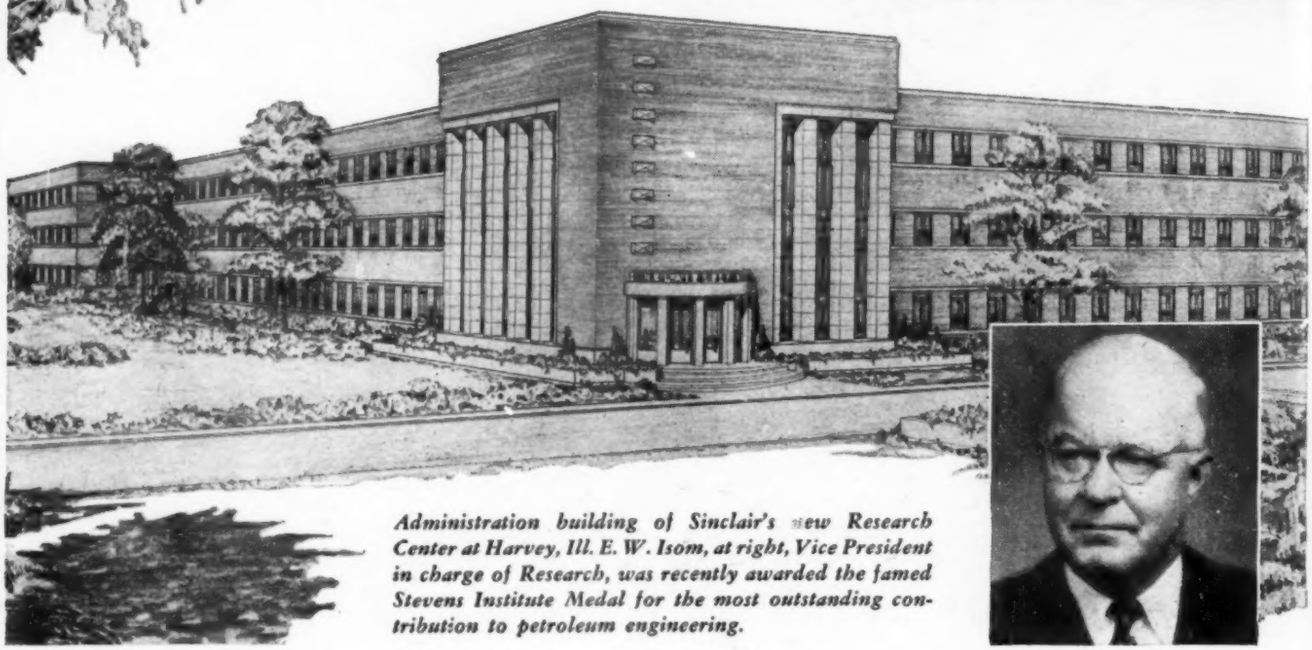
. . . to solve your lubrication problems



Administration building of Sinclair's new Research Center at Harvey, Ill. E. W. Isom, at right, Vice President in charge of Research, was recently awarded the famed Stevens Institute Medal for the most outstanding contribution to petroleum engineering.

Sinclair is completing a new $4,000,000 petroleum research and development laboratory at Harvey, Ill. This great research center — to be the most modern and best equipped in the industry — climaxes more than 30 years of consistent achievement in the development of superior products for the solution of your most difficult lubrication problems.

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But to Behr-Manning, *lasting* reputation is more than time's stamp of approval for past performances. The needs of the future for progressively improved quality are to us a twofold challenge—a challenge in research and a challenge in methods engineering.

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Dedicated to the accomplishment of these objectives, we enter our fourth quarter-century of quality and service to Industry.

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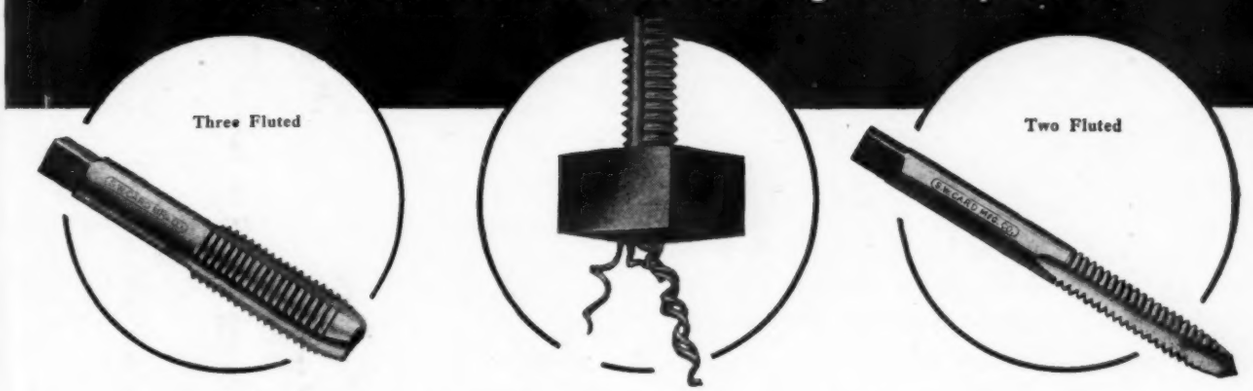
CARD SPIRAL POINTED TAPS

for free, accurate thread cutting in deep holes



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GRINDING TIPS

. . . HOW TO GRIND CARBIDE-TIPPED TOOLS

ARE CHIPPED AND CRACKED carbide-tipped tools a common complaint in your shop? Are your grinding wheels wearing out too soon? Here are two "tips" on grinding which Robertson engineers have found very helpful in conserving both tools and wheels.

The grinding of carbide tools by applying heavy pressure against the wheel is extremely harmful. Actually, grinding is accomplished much faster, and with much more satisfactory results, by passing the tool slowly across the face of the grinding wheel with a light, uniform pressure. This results in fewer wheel dressings, making for longer wheel life, and eliminates chipping and cracking of tips.

Grinding both the shank and the carbide tip at the same time glazes the grinding wheel and generates excess heat, causing the wheel to lose its free-cutting action. This will also chip or crack the tip and tend to loosen it in its setting. These faults are overcome by undercutting the shank about 2° more than the carbide tip.

Robertson Cool-Cut wheels for grinding carbide-tipped tools range from 6" x 1" up to and including 14" x 4" x 11", all plate-mounted.

Highly satisfactory results have been obtained using our GC60-I-2V for roughing operations and our C120-HV for finishing operations. For the best results from any grinding operation, make sure your grinding wheels are Robertson Cool-Cuts . . . the wheels that are precision-built for the toughest jobs.

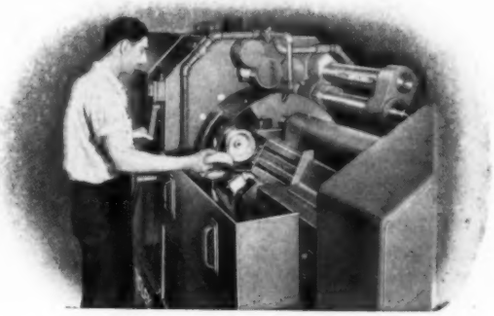
ROBERTSON COOL-CUT

ROBERTSON MANUFACTURING COMPANY
TRENTON 5, NEW JERSEY

Manufacturers of Vitrified Grinding Wheels • Mounted Wheels • Segments

If you visit the Wico Electric plant

they will probably point out this machine



This progressive manufacturer, ever alert to increasing manufacturing efficiency, sought a better way to machine a rather large and "difficult" magneto housing. There are three different materials in the piece—aluminum die casting, steel bushing and liner, and brass spacer. The tapered hole in the bushing requires a fine finish and close tolerance. The inside diameter of the liners must also be closely maintained.

The housing was formerly turned out on four turret lathes at the rate of 28.8 per hour. New Britain engineers proposed replacing these four lathes with a single Model 695 New Britain chucking machine. Here are the results:

Regular production rate over a six-month period — 102 pieces per hour. Uniformity and over-all quality substantially improved. Cost per piece reduced from 55¢ to 12.8¢. Operator fatigue practically eliminated. Wico management reports that the new machine will pay for itself in less than two years, and completely meets every requirement on this "difficult" piece.

Since the earliest days of automatic machines, the ability of New Britains to reduce production costs and provide a foundation for increased employment has been an important factor in the growth of American manufacturing. This ability, as well as the range of work New Britain automatics can perform, is constantly being expanded by New Britain engineering and research. Why not check over *your* work with the New Britain sales engineer in your locality.

ENGINEERING DETAILS

Fourteen tools are fed in by the main tool slide, and the fact that three different metals are cut at the same time makes the production rate outstanding. To produce the fine finish and close tolerance of the taper bushing hole, two boring, one counter-boring and two taper reaming operations are performed. Two roughing cuts and one finish operation are employed to assure high uniformity and good finish in machining the segment inserts.

LOWER COSTS . . .
KEY TO MORE SALES AND FULL EMPLOYMENT

New Britain

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

You're looking at a saving of $199,680!

Compare...
BAR STOCK
Weight per foot: 6.835 lbs.
Machining: 40 sec. per unit
TUBING
Weight per foot: 1.795 lbs.
Machining: 10 sec. per unit
Total amount of stock used, 690,000 feet.
Total estimated savings in material amount to $49,680. Savings in machining time are estimated at $150,000.
(Actual part not shown at request of manufacturer.)
BAR STOCK
TUBING

HERE'S an actual cost comparison—based on figures from the records of a company which in 1935 converted from bar stock to Timken seamless mechanical tubing for making tubular parts.

By their own accounting, Timken seamless tubing has saved them—in material and machining time—$199,680!

Machining tubular parts from Timken seamless tubing eliminates drilling, reduces scrap and speeds production. And you'll find higher *quality* parts often result—because this fine alloy steel tubing is tailored to exactly the size, grade and finish you need.

Why not let the skill and experience of our Technical Staff help you reduce costs, or improve your product, or *both?* For an "on-your-job" analysis (no obligation) and our free booklet "Timken Seamless Steel Tubes, Finishes and Sizes", write to Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.

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Specialists in alloy steel—including hot rolled and cold finished all ... steel bars—a complete range of stainless, graphitic and standard ... analyses—and alloy and stainless seamless steel tubing.